

USER'S MANUAL



CT-MSL01 Series

Micro-ATX Industrial Motherboard

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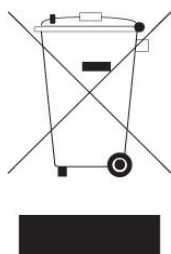
Safety Information

Electrical Safety

- To prevent electrical shock hazard, disconnect the power cable from the electrical outlet before relocating the system.
- When adding or removing devices to or from the system, ensure that the power cables for the devices are unplugged before the signal cables are connected. If possible, disconnect all power cables from the existing system before you add a device.
- Before connecting or removing signal cables from the motherboard, ensure that all power cables are unplugged.
- Seek professional assistance before using an adapter or extension cord. These devices could interrupt the grounding circuit.
- Make sure that your power supply is set to the correct voltage in your area. If you are not sure about the voltage of the electrical outlet you are using, contact your local power company.
- If the power supply is broken, do not try to fix it by yourself. Contact a qualified service technician or your retailer.

Operation Safety

- Before installing the motherboard and adding devices on it, carefully read all the manuals that came with the package.
- Before using the product, make sure all cables are correctly connected and the power cables are not damaged. If you detect any damage, contact your dealer immediately.
- To avoid short circuits, keep paper clips, screws, and staples away from connectors, slots, sockets and circuitry.
- Avoid dust, humidity, and temperature extremes. Do not place the product in any area where it may become wet.
- Place the product on a stable surface.
- If you encounter technical problems with the product, contact a qualified service technician or your retailer.



The symbol of the crossed out wheeled bin indicates that the product (electrical and electronic equipment) should not be placed in municipal waste. Check local regulations for disposal of electronic products.

Safety Declaration

This device complies with the requirements in Part 15 of the FCC rules. Operation is subject to the following two conditions:

- This device may not cause harmful interference.
- This device must accept any interference received, including interference that may cause undesired operation.

About this guide

This user guide contains the information you need when installing and configuring the motherboard.

How this guide is organized

This manual contains the following parts:

- **Chapter 1: Product introduction**

This chapter describes the features of the motherboard and the new technology it supports. This chapter also lists the hardware setup procedures that you have to perform when installing system components. It includes description of the jumpers and connectors on the motherboard.

- **Chapter 2: BIOS setup**

This chapter tells how to change system settings through the BIOS Setup menus. Detailed descriptions of the BIOS parameters are also provided.

Where to find more information

Refer to the following sources for additional information and for product and software updates.

1. Technical Support

If a problem arises with your system and no solution can be obtained from the user's manual, please contact your place of purchase or local distributor.

2. Optional documentation

Your product package may include optional documentation, such as warranty flyers, that may have been added by your dealer. These documents are not part of the standard package.

Conventions used in this guide

To make sure that you perform certain tasks properly, take note of the following symbols used throughout this manual.



DANGER/WARNING: Information to prevent injury to yourself when trying to complete a task.



CAUTION: Information to prevent damage to the components when trying to complete a task.



IMPORTANT: Instructions that you **MUST** follow to complete a task.



NOTE: Tips and additional information to help you complete a task.

Typography

Bold text	Indicates a menu or an item to select
Italics	Used to emphasize a word or a phrase
<Key>	Keys enclosed in the less-than and greater-than sign means that you must press the enclosed key Example: <Enter> means that you must press the Enter or Return key
<Key1>+<Key2>+<Key3>	If you must press two or more keys simultaneously, the key names are linked with a plus sign (+) Example: <Ctrl>+<Alt>+<D>
Command	Means that you must type the command exactly as shown, then supply the required item or value enclosed in brackets Example: At the DOS prompt, type the command line:

Packing List

Before you begin installing your single board, please make sure that the following materials have been shipped:

- 1 x CT-MSL01 Micro-ATX Main board
- 1 x I/O Shield
- 1 x SATA Cable



If any of the above items is damaged or missing, please contact your retailer.

Revision History

Revision	Revision History	Date
V 0.1	First release version	Oct., 2016

Specifications Summary

System

- CPU: Intel® LGA1151 socket supports Intel® Core™ i7/ i5/ i3 CPU
- BIOS: AMI 64MB SPI
- System Chipset: Intel® Q170
- Memory: 4x DIMM Up to 64GB Dual Channel DDR4 2133MHz
- Watchdog Timer: 1~255 sec timer
- H/W Status Monitor:
 - CPU & system temperature monitoring
 - Voltages monitoring
- Expansion Slots
 - 1 x PCIe x 16 Slot (Black)
 - 1 x PCIe x 4 Slot (Black)
 - 1 x PCIe x 1 Slot (Black)
 - 1 x PCI Slot (White)
 - 1 x Half Size Mini-PCIe
 - 1 x M.2 Slot (with PCIe x4 & SATA III)
- Smart Fan Control: Yes

Display

- Chipset: Intel® Integrated Graphic (CPU Dependent)
- Display Memory: Shared Memory

Ethernet

- LAN1: Intel® I219-LM PHY LAN Controller
- LAN2: Intel® I211-AT PCIe LAN Controller (Co-Lay Intel® I210-AT)

Back I/O Port

- **Back Panel**
 - 2 x RS-232/422/485 DB9 Connector
 - 1 x Display Port Connector
 - 1 x HDMI Connector
 - 1 x VGA Connector
 - 1 x DVI-D Connector
 - 2 x Stack up RJ45 and USB 3.0 Connectors
 - 1 x 3 Jacks Audio ConnectorPS/2: 1x PS/2 KB/MS

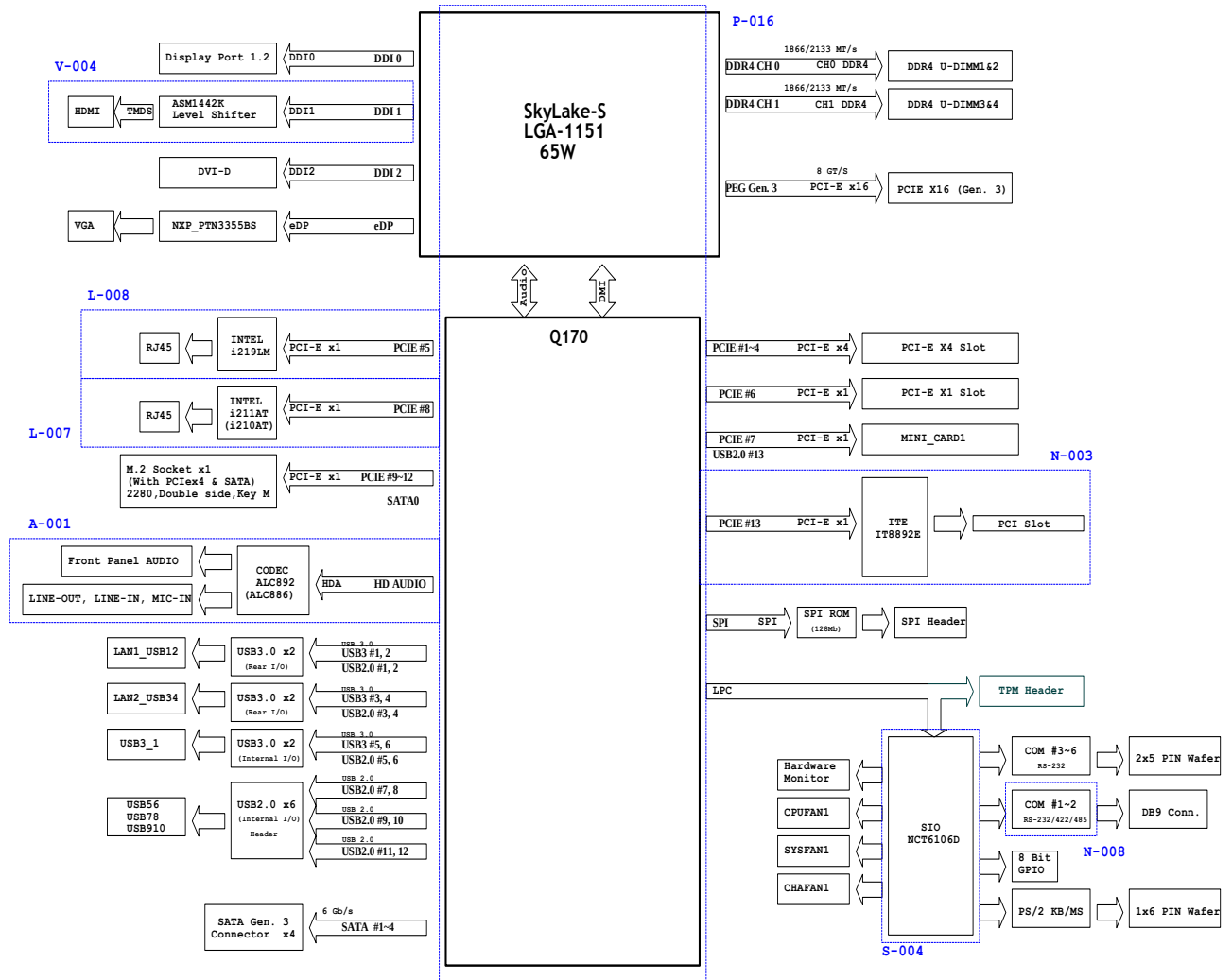
Internal I/O Connector

- **Back Panel**
 - 4 x SATAIII connectors(RED) & 1 x SATAIII shared with M.2
 - 3 x USB 2.0 headers support 6 ports
 - 1 x USB 3.0 header support 2 ports
 - 4 x RS232 pin 2.00 mm box header
 - 1 x LPC Header
 - 1 x SPI Header
 - 1 x Front Audio Header
 - 1 x SPDIF Header
 - 1 x CPU Fan connector
 - 2 x SYS Fan connector
 - 1 x Front panel header
 - 1 x TPM header
 - 1 x 8 bits GPIO box header
 - 1 x Front PS/2 KB & MS box header
 - 1 x Horizontal Socket Type CMOS Battery Holder
 - 1 x 24-pin ATX Power connector
 - 1 x 4-pin ATX 12V Power connector

Mechanical & Environment

- Operating Temp.: 0°C ~ 60°C (32°F ~ 140°F)
- Operating Humidity: at 40C 95% relative humidity, non-condensing
- Size (L x W): 9.6 inch x 9.6 inch

Block Diagram



Chapter 1

Product Introductions

1.1 Before you proceed

Take note of the following precautions before you install motherboard components or change any motherboard settings.



- Unplug the power cord from the wall socket before touching any component.
- Use a grounded wrist strap or touch a safely grounded object or a metal object, such as the power supply case, before handling components to avoid damaging them due to static electricity
- Hold components by the edges to avoid touching the ICs on them.
- Whenever you uninstall any component, place it on a grounded anti-static pad or in the bag that came with the component.
- Before you install or remove any component, ensure that the ATX power supply is switched off or the power cord is detached from the power supply. Failure to do so may cause severe damage to the motherboard, peripherals, and/or components.

1.2 Motherboard Overview

Before you install the motherboard, study the configuration of your chassis to ensure that the motherboard fits into it. Refer to the chassis documentation before installing the motherboard.



Make sure to unplug the power cord before installing or removing the motherboard. Failure to do so can cause you physical injury and damage motherboard components.

1.2.1 Placement Direction

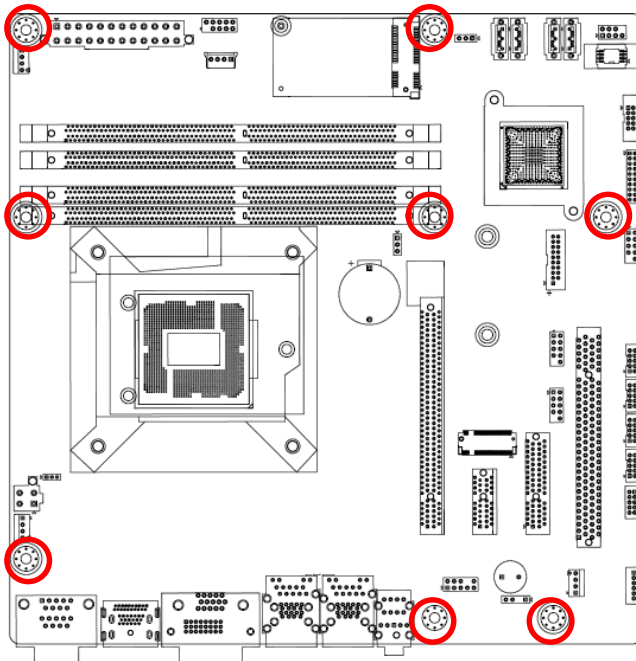
When installing the motherboard, make sure that you place it into the chassis in the correct orientation. The edge with external ports goes to the rear part of the chassis as indicated in the image below.

1.2.2 Screw Holes

Place eight (8) screws into the holes indicated by circles to secure the motherboard to the chassis.

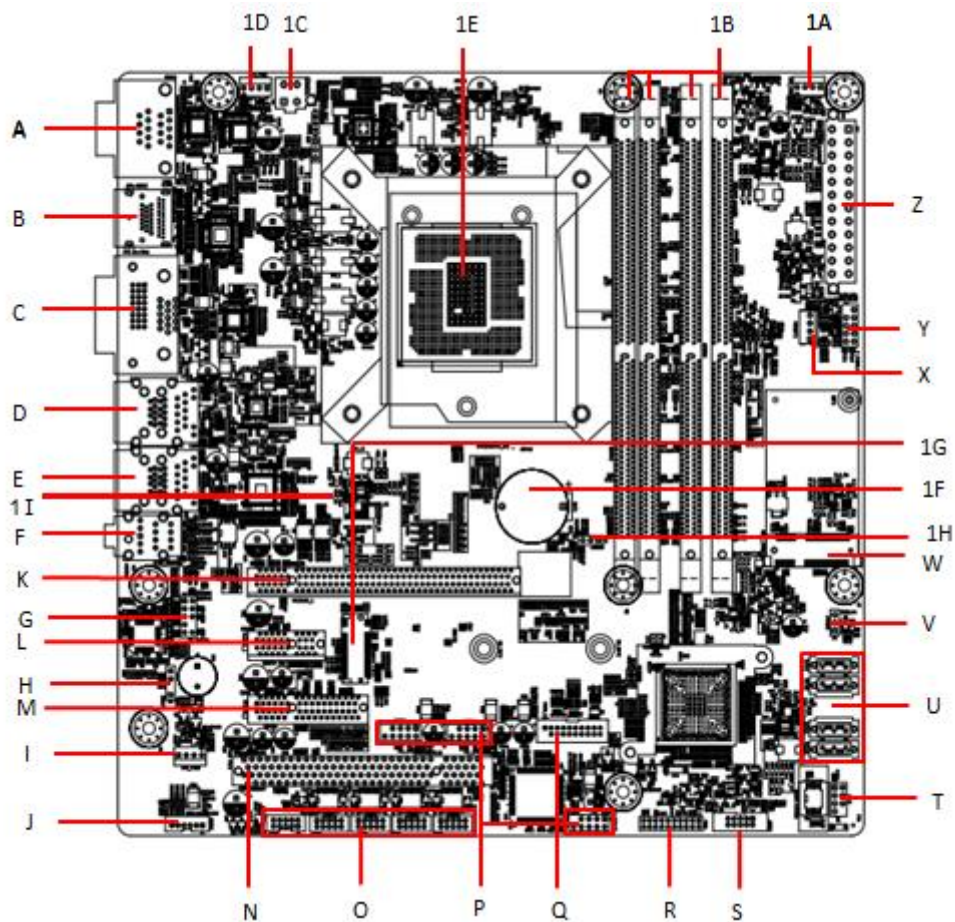


Do not over tighten the screws! Doing so can damage the motherboard.



Place this side towards the rear of the chassis.

1.2.3 Motherboards Layout



1.2.4 Layout Content List

Slots & sockets		
Label	Function	Note
CPU1 (1E)	LGA1151 socket	
DIMMA1~B2 (1B)	DDR4 DIMM Slot A1~B2	
PCIEX16_1 (K)	PCI-e x16 Slot	
PCIEX1_1 (L)	PCI-e x1 Slot	
PCIEX4_1 (M)	PCI-e x4 Slot	
PCI1 (N)	PCI Slot	

Jumpers		
Label	Function	Note
JCMOS1 (1H)	Clear CMOS	3 x 1 header, pitch 2.54mm
JPSO1 (V)	AT/ATX Mode Select	3 x 1 header, pitch 2.54mm
JVGA1 (1I)	VGA Enable/Disable	3 x 1 header, pitch 2.54mm

Rear Panel Connector		
Label	Function	Note
COM12 (A)	2 COM port connector	COM1(lower)+COM2(upper)
DP1+HDMI1 (B)	DP+ HDMI connector	DP(lower)+HDMI(upper)
DVI-D1+VGA1 (C)	DVI-D+ VGA connector	VGA(lower)+DVI(upper)
LAN1_USB12	RJ-45 Ethernet Connector x 1 USB 3.0 Connector x 2	
LAN2_USB34	RJ-45 Ethernet Connector x 1 USB 3.0 Connector x 2	
AUDIO1 (F)	3 audio phone jack	

Internal Connector		
Label	Function	Note
CPU_FAN1 (1D)	CPU fan connector	4 x 1 wafer, pitch 2.54mm
SYS_FAN1 (1A)	System fan connector	4 x 1 wafer, pitch 2.54mm
SYS_FAN2 (I)	Chassis fan connector	4 x 1 wafer, pitch 2.54mm
F_PANEL1 (Y)	Intel front panel connector	5 x 2 header, pitch 2.54mm
EATXPWR1 (Z)	ATX power connector	12 x 2 wafer
ATX12V1 (1C)	12V ATX power connector	2 x 2 wafer
COM3 ~ 6 (O)	Serial port connector	5 x 2 wafer, pitch 2.00mm
SATA1 ~ 4 (U)	SATA data connector	7P Male connector
USB78/910/1112 (P)	USB2.0 connector	5 x 2 header, pitch 2.54mm
TPM1 (R)	TPM header	10 x 2 wafer, pitch 2.00mm
USB56 (Q)	USB 3.0 connector	10 x 2 header, pitch 2.54mm
MINI_CARD1 (W)	Mini PCIe connector	Support full length mini PCIe card
NGFF1 (1G)	M.2 connector	
BAT1 (1F)	RTC battery holder	
SPI1 (T)	SPI header	4 x 2 header, pitch 2.54mm
JLPC1 (S)	Port 80	5 x 2 wafer, pitch 2.00mm
JDIO1 (O)	DIO connector	5 x 2 wafer, pitch 2.00mm
KBMS1 (J)	PS2 connector	6 x 1 wafer, pitch 2.00mm
FP_AUDIO1 (G)	Front audio header	5 x 2 header, pitch 2.54mm
SPDIF1 (H)	SPDIF out header	4 x 1 header, pitch 2.54mm

1.3 Central Processing Unit (CPU)

The motherboard comes with a surface mount LGA1151 socket designed for the Intel® Core™ i7/ i5/ i3 processor in the 1151-land package.



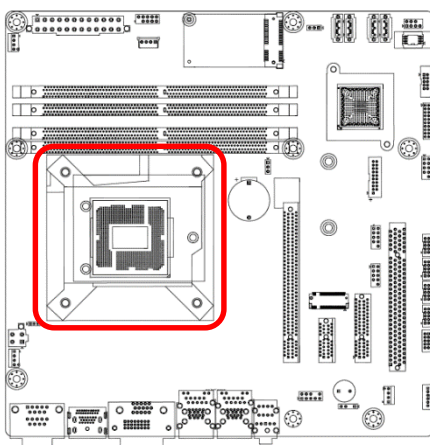
- Your boxed Intel® Core™ i7/ i5/ i3 LGA1155 processor package should come with installation instructions for the CPU, fan and heatsink assembly. If the instructions in this section do not match the CPU documentation, follow the latter.
- Upon purchase of the motherboard, make sure that the PnP cap is on the socket and the socket pins are not bent. Contact your retailer immediately if the PnP cap is missing, or if you see any damage to the PnP cap/socket pins/motherboard components. ADVANSUS will shoulder the cost of repair only if the damage is shipment/transit-related.
- Keep the cap after installing the motherboard. ADVANSUS will process Return Merchandise Authorization (RMA) requests only if the motherboard comes with the cap on the LGA1151 socket.
- The product warranty does not cover damage to the socket pins resulting from incorrect CPU installation/removal, or misplacement/loss/incorrect removal of the PnP cap.
- Install the CPU fan and heatsink assembly before you install motherboard to the chassis.



If you purchased a separate CPU heatsink and fan assembly, make sure that you have properly applied Thermal Interface Material to the CPU heatsink or CPU before you install the heatsink and fan assembly.

1.3.1 Installing the CPU

1. Locate the CPU socket on the motherboard.

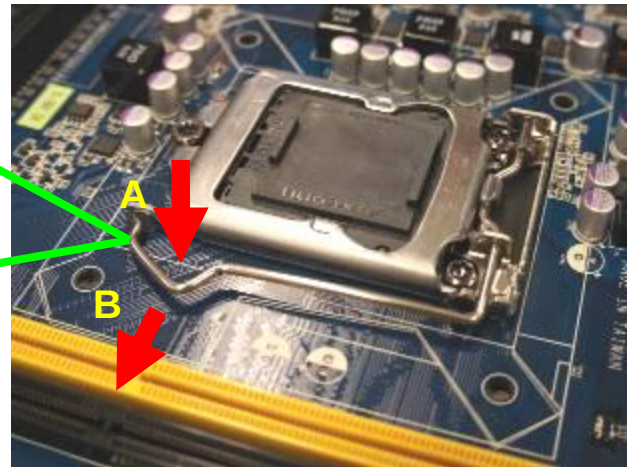


Before installing the CPU, make sure that the socket box is facing towards you and the load lever is on your left.

2. Press the load lever with your thumb (A), then move it to the left (B) until it is released from the retention tab.

Retention tab

Load lever



To prevent damage to the socket pins, do not remove the PnP cap unless you are installing a CPU.

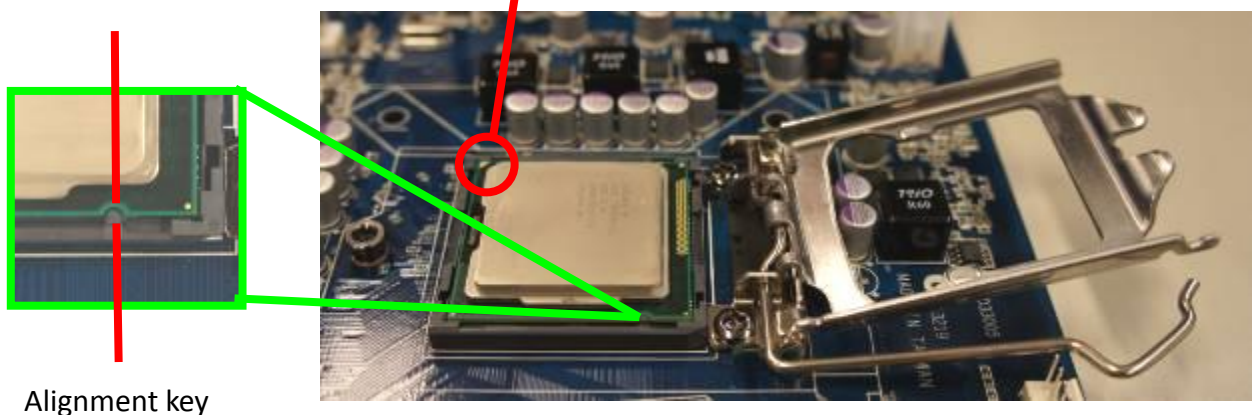
3. Lift the Load lever with your thumb and forefinger to around 180° angle (A), then pull the PnP cap from the CPU socket to remove (B).



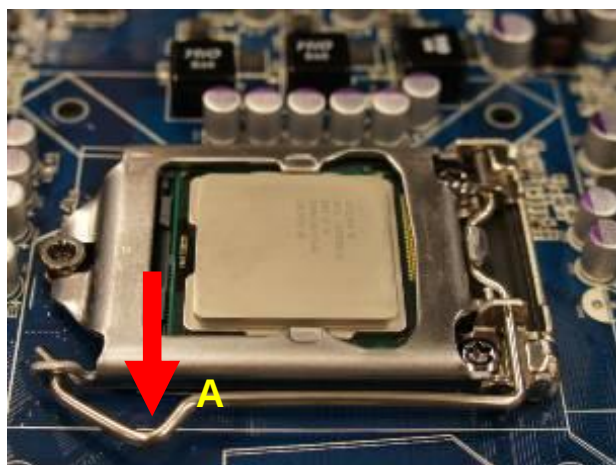
4. Position the CPU over the socket, making sure that the gold triangle is on the top-left corner of the socket then fit the socket alignment key into the CPU notch.

CPU notch

Gold triangle



5. Pull back the load lever, then push the load lever (A) until it snaps into the retention tab.



The CPU fits in only one correct orientation. DO NOT force the CPU into the socket to prevent bending the connectors on the socket and damaging the CPU!

1.3.2 Installing the CPU Heatsink and Fan

Intel® Core™ i7/ i5/ i3 LGA1151 processor requires a specially designed heatsink and fan assembly to ensure optimum thermal condition and performance.



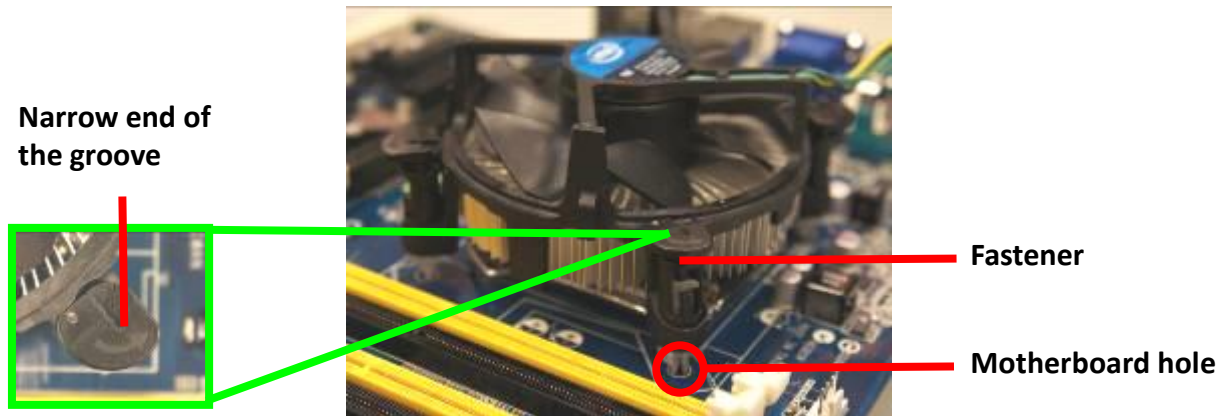
- Install the motherboard to the chassis before you install the CPU fan and heatsink assembly.
- When you buy a boxed Intel® Core™ i7/ i5/ i3 LGA1151 processor, the package includes the CPU fan and heatsink assembly. If you buy a CPU separately, make sure that you use only Intel® certified multi-directional heatsink and fan.
- Your Intel® Core™ i7/ i5/ i3 LGA1151 processor LGA1151 heatsink and fan assembly comes in a push-pin design and requires no tool to install.



If you purchased a separate CPU heatsink and fan assembly, make sure that you have properly applied Thermal Interface Material to the CPU heatsink or CPU before you install the heatsink and fan assembly.

To install the CPU heatsink and fan:

1. Place the heatsink on top of the installed CPU, making sure that the four fasteners match the holes on the motherboard.

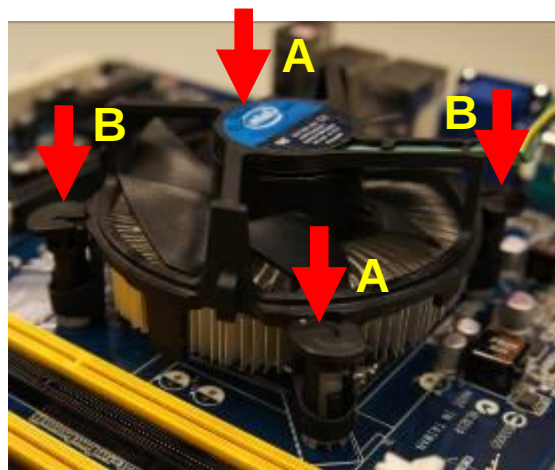
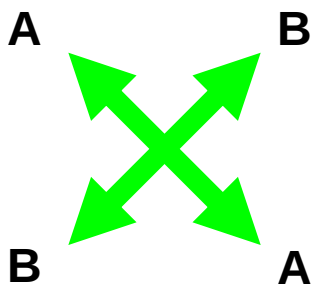


Orient the heatsink and fan assembly such that the CPU fan cable is closest to the CPU fan connector.

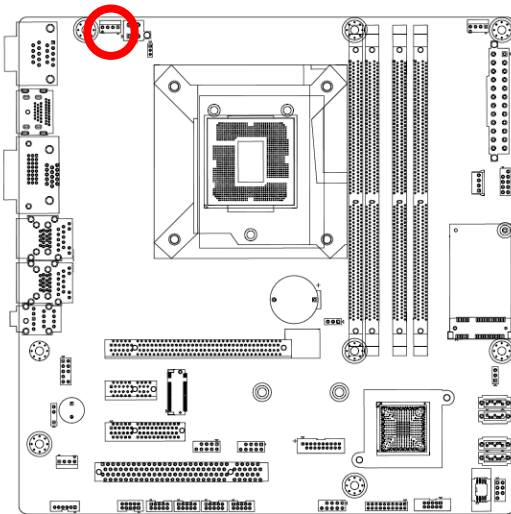


Make sure each fastener is oriented as shown, with the narrow groove directed outward.

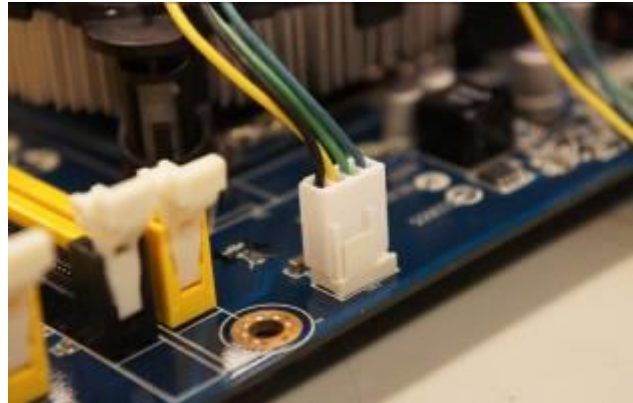
2. Push down two fasteners at a time in a diagonal sequence to secure the heatsink and fan assembly in place.



3. Connect the CPU fan cable to the connector on the motherboard labeled CPU_FAN1.

**CPU FAN1**

- | | |
|---|------------|
| 4 | FAN_PWM1_C |
| 3 | FANCPUDEC1 |
| 2 | +V12 |
| 1 | GND |

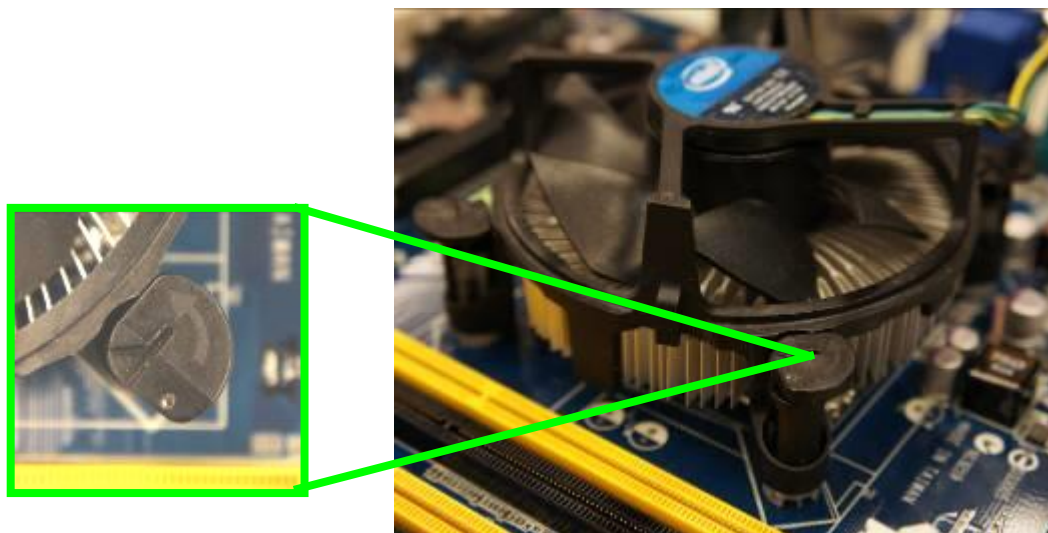


Do not forget to connect the fan cables to the fan connectors. Insufficient air flow inside the system may damage the motherboard components. These are not jumpers! DO NOT place jumper caps on the fan connectors.

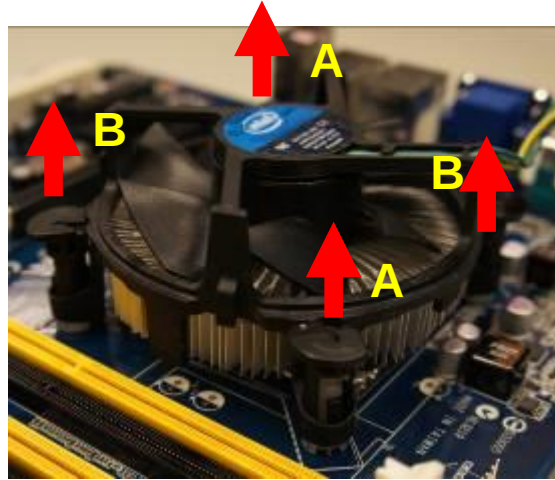
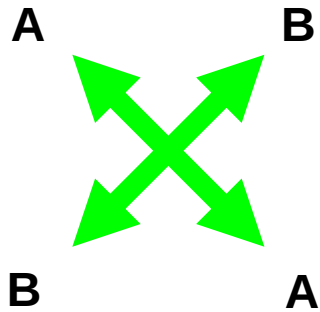
1.3.3 Uninstalling the CPU Heatsink and Fan

To uninstall the CPU heatsink and fan:

1. Disconnect the CPU fan cable from the connector on the motherboard.
2. Rotate each fastener counterclockwise



3. Pull up two fasteners at a time in a diagonal sequence to disengage the heatsink and fan assembly from the motherboard.



4. Carefully remove the heatsink and fan assembly from the motherboard.



5. Rotate each fastener clockwise to ensure correct orientation when reinstalling.

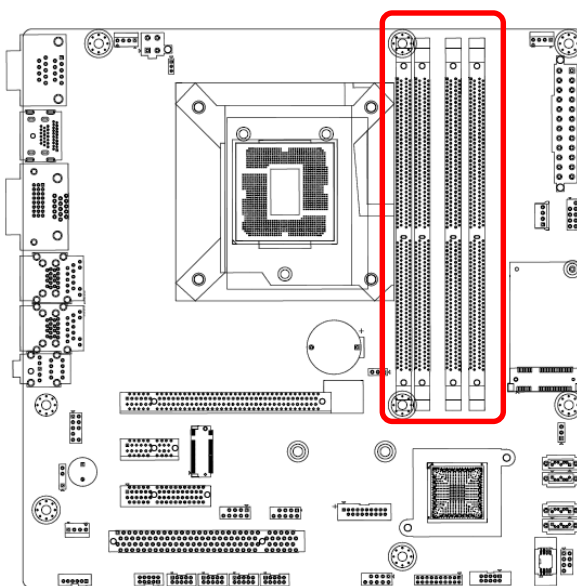


1.4 System Memory

1.4.1 Overview

The motherboard comes with four 288-pin Double Data Rate 4 (DDR4) Dual Inline Memory Modules (DIMM) sockets.

DDR4 SDRAM, an abbreviation for double data rate fourth generation synchronous dynamic random-access memory, is a type of synchronous dynamic random-access memory (SDRAM) with a high bandwidth ("double data rate") interface. The primary advantages of DDR4 over its predecessor, DDR3, include higher module density and lower voltage requirements, coupled with higher data rate transfer speeds. DDR4 memory comes in 288-pin DIMM modules, similar in size to 240-pin DDR3 DIMMs. The pins are spaced more closely (0.85 mm instead of 1.0) to fit the increased amount within the same 5¼ inch (133.35 mm) standard DIMM length but, the height is increased slightly (31.25 mm/1.23 in instead of 30.35 mm/1.2 in) to make signal routing easier, and the thickness is also increased (to 1.2 mm from 1.0) to accommodate more signal layers. DDR4 DIMM modules have a slightly curved edge connector so not all of the pins are engaged at a time during module insertion, lowering the insertion force.



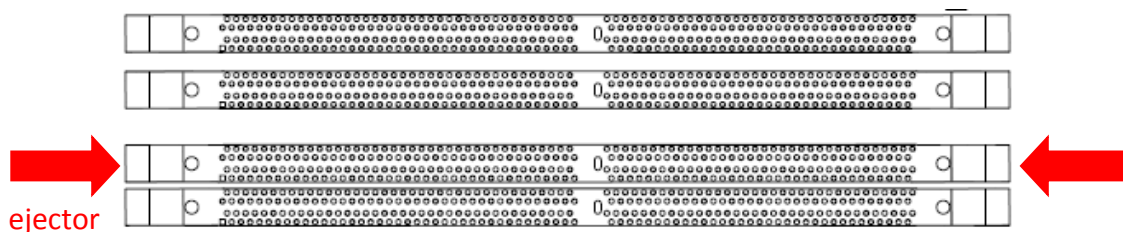
288-Pin DDR4 U-DIMM sockets

1.4.2 Installing a DIMM



Make sure to unplug the power cord before installing or removing the motherboard. Failure to do so can cause you physical injury and damage motherboard components.

1. Locate the DIMM socket on the board.
2. Hold two edges of the DIMM module carefully, and keep away of touching its connectors.
3. Align the notch key on the module with the rib on the slot.
4. Firmly press the modules into the socket which will automatically snap into the mounting notch. Do not force the DIMM module in with extra force as the DIMM module only fits in one direction.



- A DDR4 DIMM is keyed with a notch so that it fits in only one direction. DO NOT force a DIMM into a socket to avoid damaging the DIMM.
- The DDR4 DIMM sockets do not support DDR/DDR2/DDR3 DIMMs. DO NOT install DDR/DDR2/DDR3 DIMMs to the DDR4 DIMM socket.

1.4.3 Removing a DDR4 DIMM

1. Press the two ejector tabs on the slot outward simultaneously, and then pull out the DIMM module.



Support the DIMM lightly with your fingers when pressing the ejector tabs. The DIMM might get damaged when it flips out with extra force.

1.5 Expansion Card

In the future, you may need to install expansion cards. The following sub-sections describe the slots and the expansion cards that they support.



Make sure to unplug the power cord before adding or removing expansion cards. Failure to do so may cause you physical injury and damage motherboard components.

1.5.1 Installing an Expansion Card

1. Before installing the expansion card, read the documentation that came with it and make the necessary hardware settings for the card.
2. Remove the system unit cover (if your motherboard is already installed in a chassis).
3. Remove the bracket opposite the slot that you intend to use. Keep the screw for later use.
4. Align the card connector with the slot and press firmly until the card is completely seated on the slot.
5. Secure the card to the chassis with the screw you removed earlier.
6. Replace the system cover.

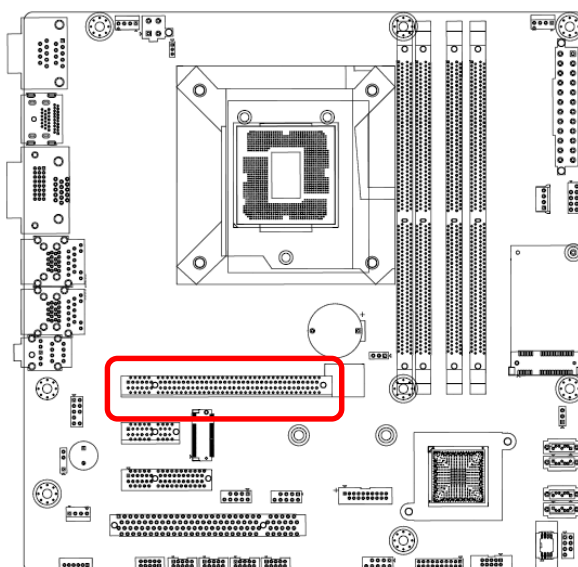
1.5.2 Installing an Expansion Card

After installing the expansion card, configure it by adjusting the software settings.

1. Turn on the system and change the necessary BIOS settings, if any. See Chapter 2 for information on BIOS setup.
2. Assign an IRQ to the card if needed. Refer to the tables on the next page.
3. Install the software drivers for the expansion card.

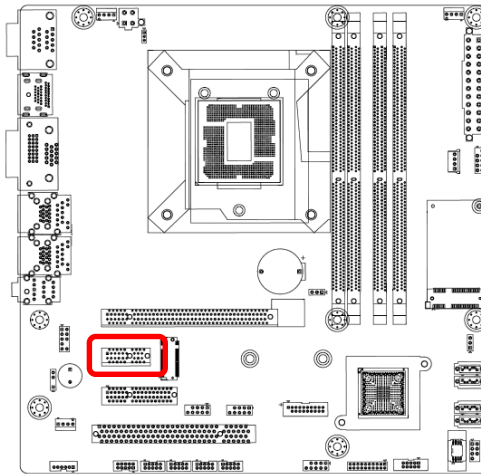
1.5.3 Installing an Expansion Card

This motherboard supports one PCI Express x16 slot that complies with the PCI Express specifications.



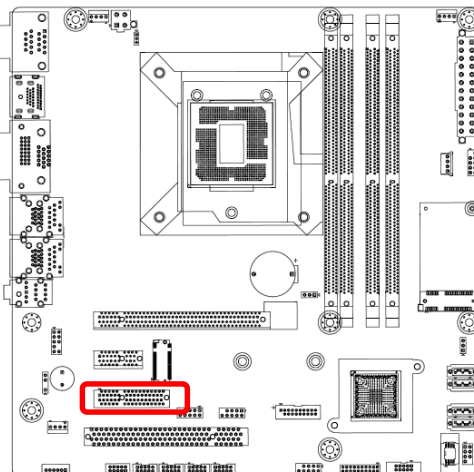
1.5.4 PCI Express x1 slot

This motherboard supports one PCIe x1 slot that complies with the PCIe x1 specifications.



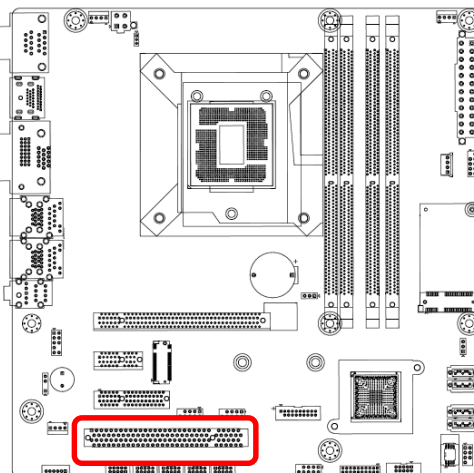
1.5.5 PCI Express x4 slot

This motherboard supports one PCIe x4 slot that complies with the PCIe x4 specifications.



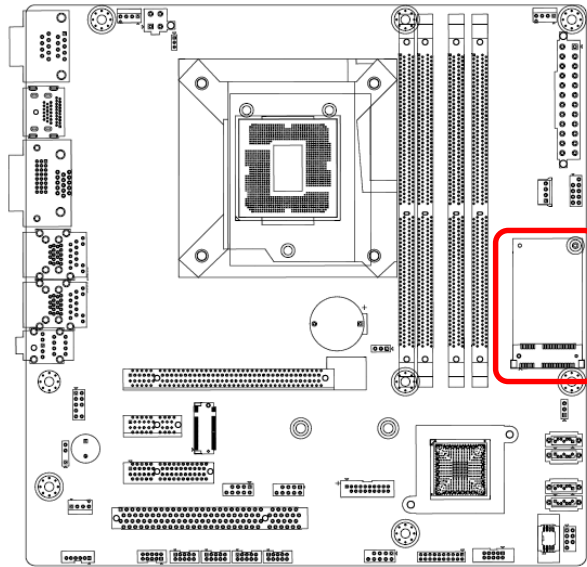
1.5.6 PCI slot

This motherboard supports one PCI slot that complies with the PCI specifications.



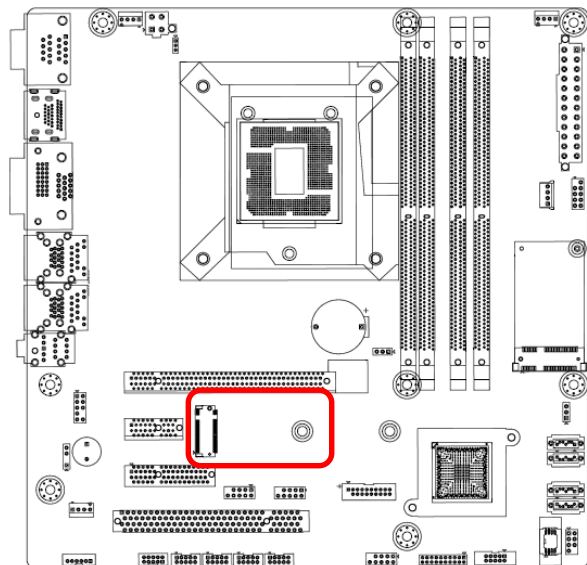
1.5.7 Mini PCIe connector

Support Full size mini-PCIe card



1.5.8 M.2 connector

Support PCIe and SATA interface of this connector.



1.6 Jumpers

1.6.1 Clear CMOS (JCMOS1)

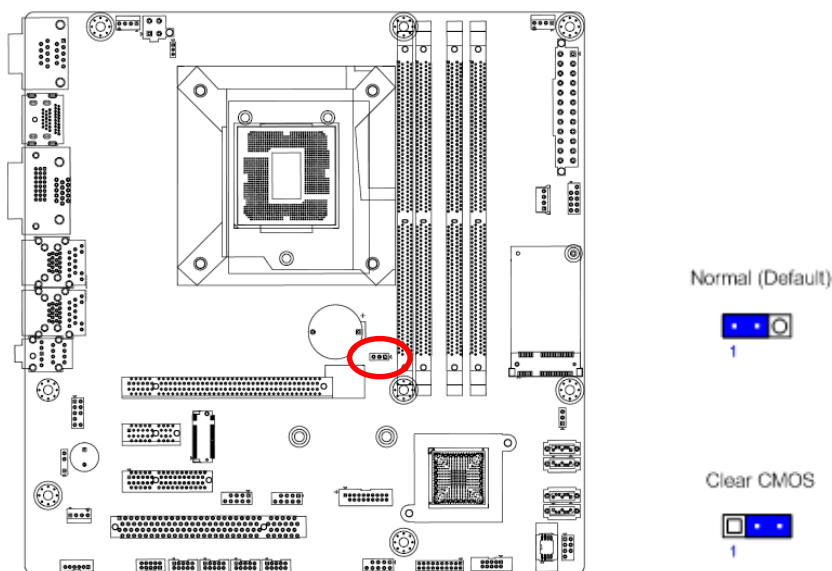
This jumper allows you to clear the Real Time Clock (RTC) RAM in CMOS. You can clear the CMOS memory of date, time, and system setup parameters by erasing the CMOS RTC RAM data. The onboard button cell battery powers the RAM data in CMOS, which includes system setup information such as system passwords.

To erase the RTC RAM:

1. Turn OFF the computer and unplug the power cord.
2. Remove the onboard battery.
3. Move the jumper cap from pins 1-2 (default) to pins 2-3. Keep the cap on pins 2-3 for about 5~10 seconds, then move the cap back to pins 1-2.
4. Re-install the battery.
5. Plug the power cord and turn ON the computer.
6. Hold down the key during the boot process and enter BIOS setup to re-enter data.



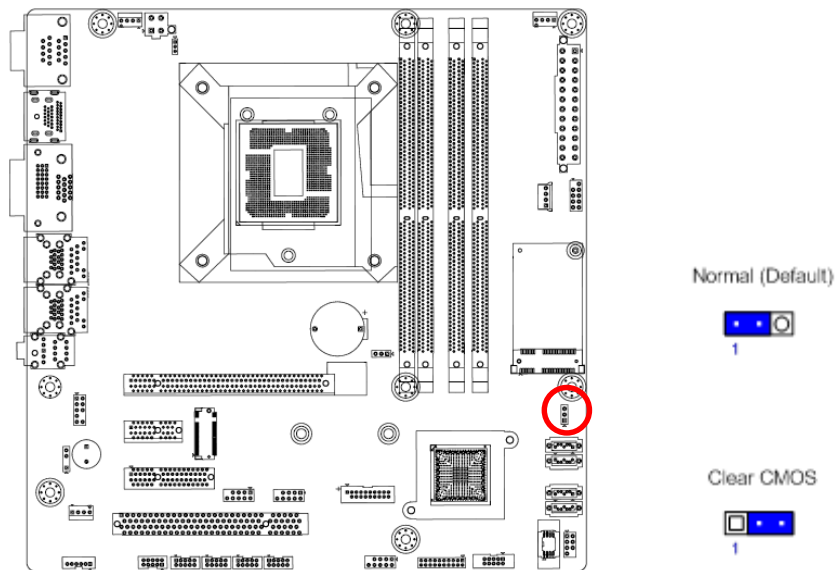
Except when clearing the RTC RAM, never remove the cap on CLRTC jumper default position. Removing the cap will cause system boot failure!



You do not need to clear the RTC when the system hangs due to overclocking. For system failure due to overclocking, use the C.P.R. (CPU Parameter Recall) feature. Shut down and reboot the system so the BIOS can automatically reset parameter settings to default values.

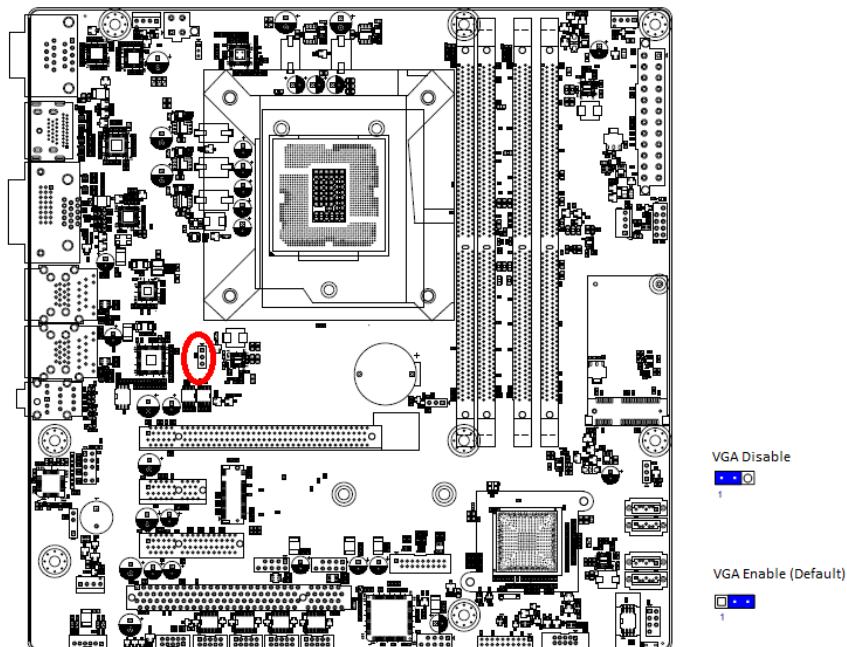
1.6.2 AT/ATX Power Mode Select (JPSON1)

This jumper allows you to select ATX Mode or AT mode



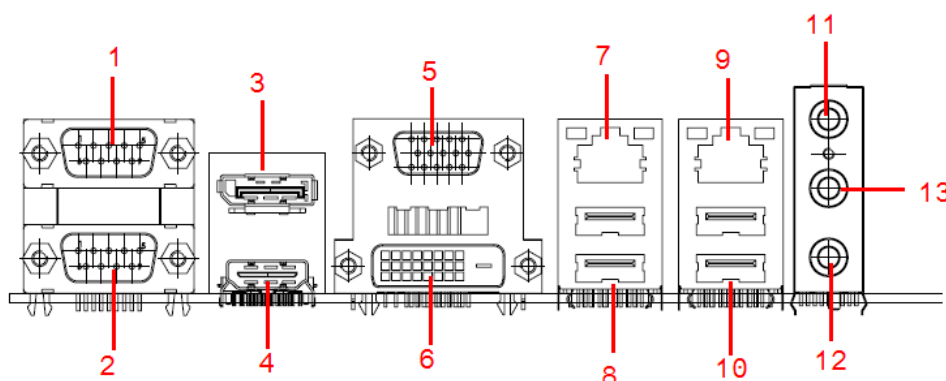
1.6.3 VGA Enable/Disable Select (JVGA1)

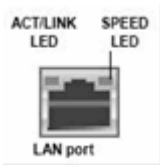
This jumper allows you to select enable VGA or disable VGA.

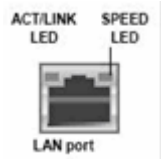


1.7 Connectors

1.7.1 Rear panel connectors

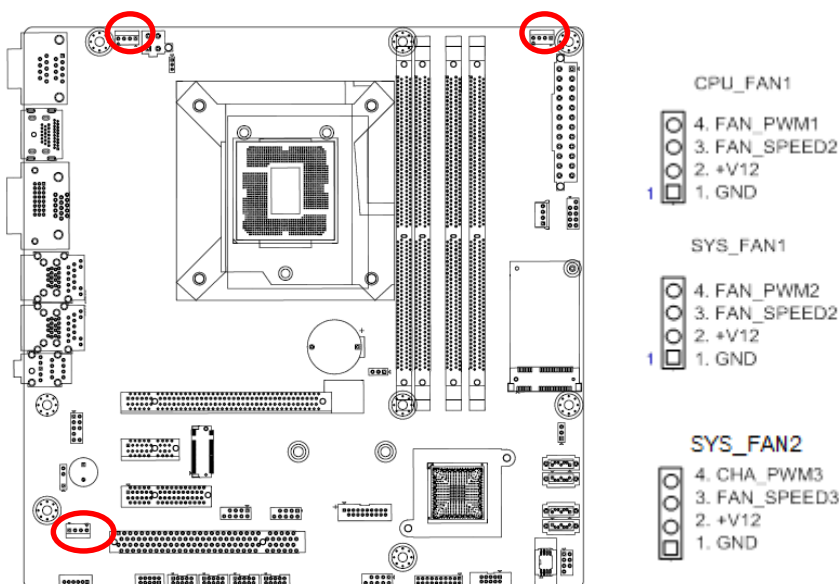


Item	Name	Function	Description			
1	COM2	Serial COM Port	The Serial COM port 2.			
2	COM1	Serial COM Port	The Serial COM port 1.			
3	DP1	Display Port	The DP port connector			
4	HDMI1	HDMI Port	The HDMI port connector			
5	VGA1	VGA Port	The VGA port connector.			
6	DVI1	DVI-D port	The DVI-D port connector			
7	LAN1	Gigabit LAN (RJ-45) Connectors 	This port allows Gigabit connection to a Local Area Network (LAN) through a network hub. Refer to the table below for the LAN port LED indications.			
			ACT/Link LED		Speed LED	
			Status	Description	Status	Description
			OFF	No link	OFF	10Mbps connection
			Yellow	Linked	Green	100Mbps connection
			Blinking	Data activity	Orange	1Gbps connection
8	USB12	USB 3.0 Connectors	These two 4-pin Universal Serial Bus (USB) ports are available for connecting USB 3.0 devices.			

Item	Name	Function	Description			
9	LAN2	Gigabit LAN (RJ-45) Connectors 	This port allows Gigabit connection to a Local Area Network (LAN) through a network hub. Refer to the table below for the LAN port LED indications.			
			ACT/Link LED		Speed LED	
			Status	Description	Status	Description
			OFF	No link	OFF	10Mbps connection
			Yellow	Linked	Green	100Mbps connection
			Blinking	Data activity	Orange	1Gbps connection
10	USB34	USB 3.0 Connectors	These two 4-pin Universal Serial Bus (USB) ports are available for connecting USB 3.0 devices.			
11	AUDIO1	Line-in port (Light blue)	This port connects a tape, CD, DVD player, or other audio sources.			
12	AUDIO1	Microphone port (Pink)	This port connects a microphone.			
13	AUDIO1	Line-out port (Lime)	This port connects a headphone or a speaker. In 4-channel, 6-channel, and 8-channel configuration, the function of this port becomes Front Speaker Out.			

1.7.2 CPU and System fan connectors (CPU_FAN1, SYS_FAN1, SYS_FAN2)

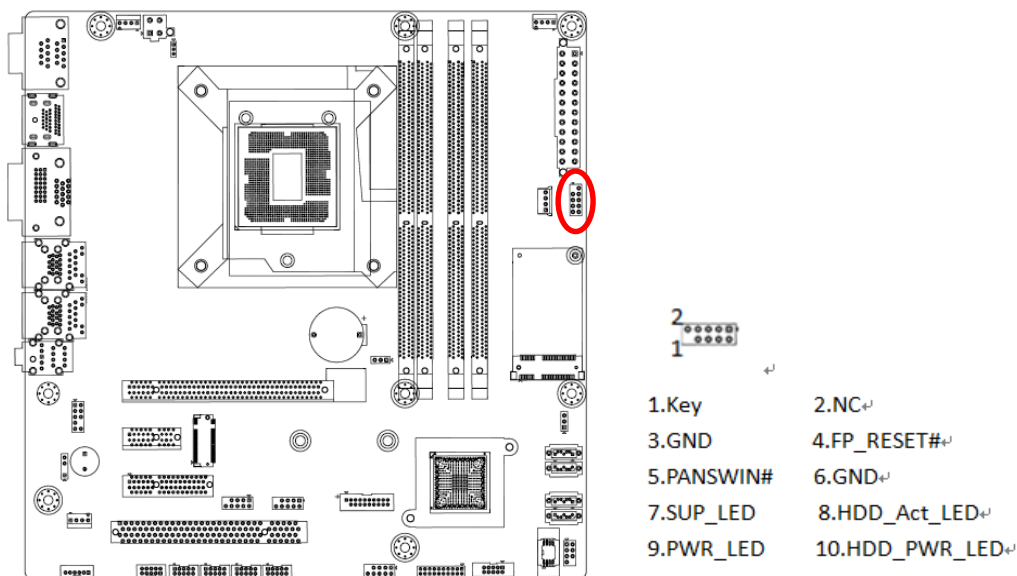
The fan connectors support cooling fans of 280mA (3.36 W max.) at 4800rpm or a total of 1A~2.22A (26.64W max.) at +12V. Connect the fan cables to the fan connectors on the motherboard, making sure that the black wire of each cable matches the ground pin of the connector.



Do not forget to connect the fan cables to the fan connectors. Insufficient air flow inside the system may damage the motherboard components. These are not jumpers! DO NOT place jumper caps on the fan connectors.

1.7.3 System Panel (F_PANEL1)

This connector is for a chassis-mounted front panel. The functions are as following.



- **ATX Power Button/Soft-off Button (Pin 3-5)**

This 2-pin connector is for the system power button. Pressing the power button turns the system on or puts the system in sleep or soft-off mode depending on the BIOS settings. Pressing the power switch and holding it for more than four seconds while the system is ON turns the system OFF.

- **Reset Button (Pin 4-6)**

This 2-pin connector is for the chassis-mounted reset button for system reboot without turning off the system power.

- **Power LED (Pin 7-9)**

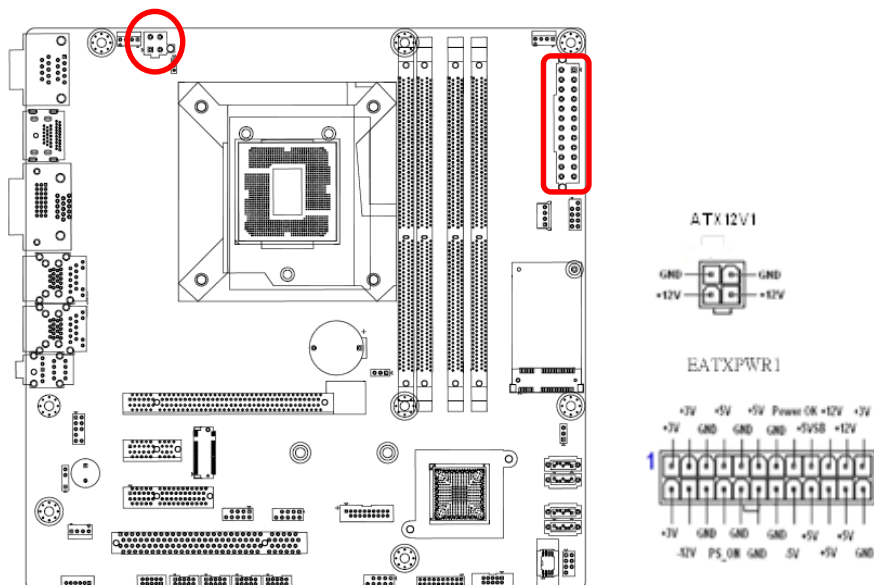
This 2-pin connector is for the system power LED. Connect the chassis power LED cable to this connector. The system power LED lights up when you turn on the system power, and blinks when the system is in sleep mode.

- **Hard Disk Drive Activity LED (Pin 8-10)**

This 2-pin connector is for the HDD Activity LED. Connect the HDD Activity LED cable to this connector. The IDE LED lights up or flashes when data is read from or written to the HDD.

1.7.4 ATX power connectors (EATXPWR1 & ATX12V1)

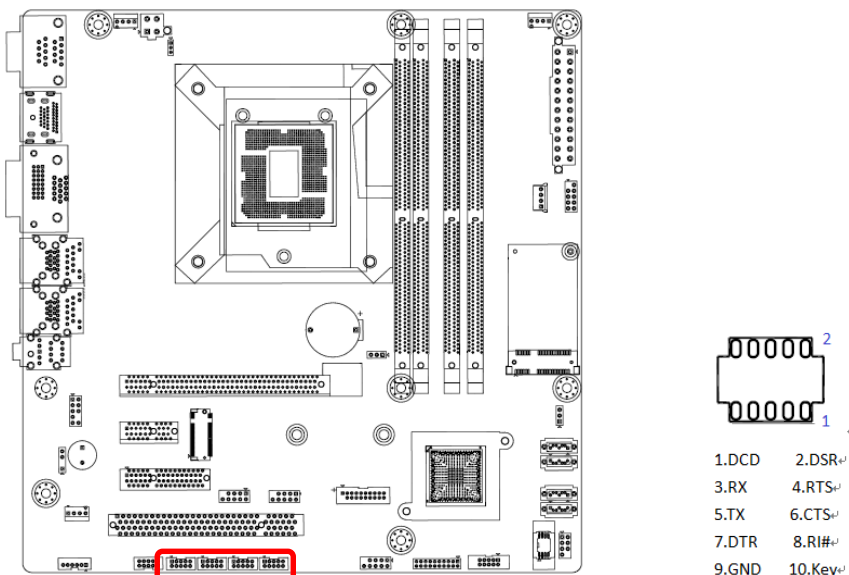
The connector is for ATX power supply plugs. The power supply plugs are designed to fit these connectors in only one orientation. Find the proper orientation and push down firmly until the connectors completely fit.



- Use of a PSU with a higher power output is recommended when configuring a system with more power-consuming devices. The system may become unstable or may not boot up if the power is inadequate.
- Make sure that your power supply unit (PSU) can provide at least the minimum power required by your system. See the table below for details.

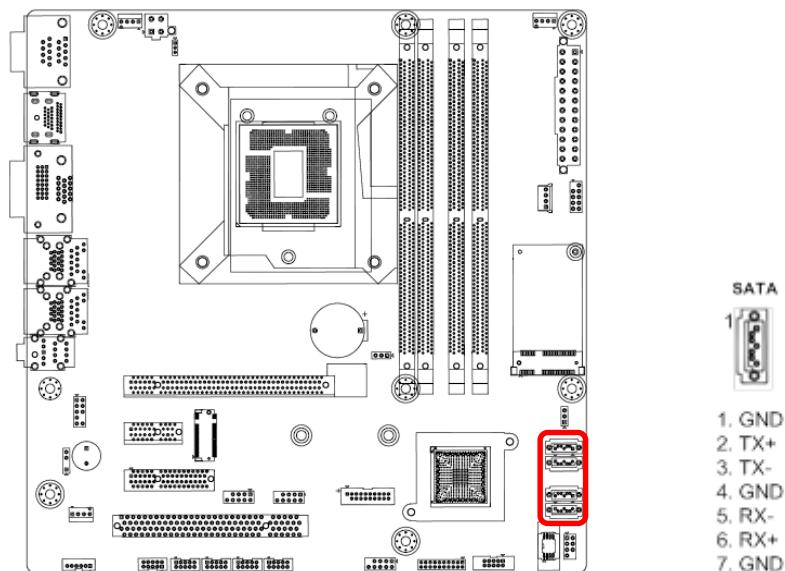
1.7.5 Serial Port connectors (COM3~6)

This connector is for a serial (COM) port. Connect the serial port module cable to this connector, then install the module to a slot opening at the back of the system chassis.



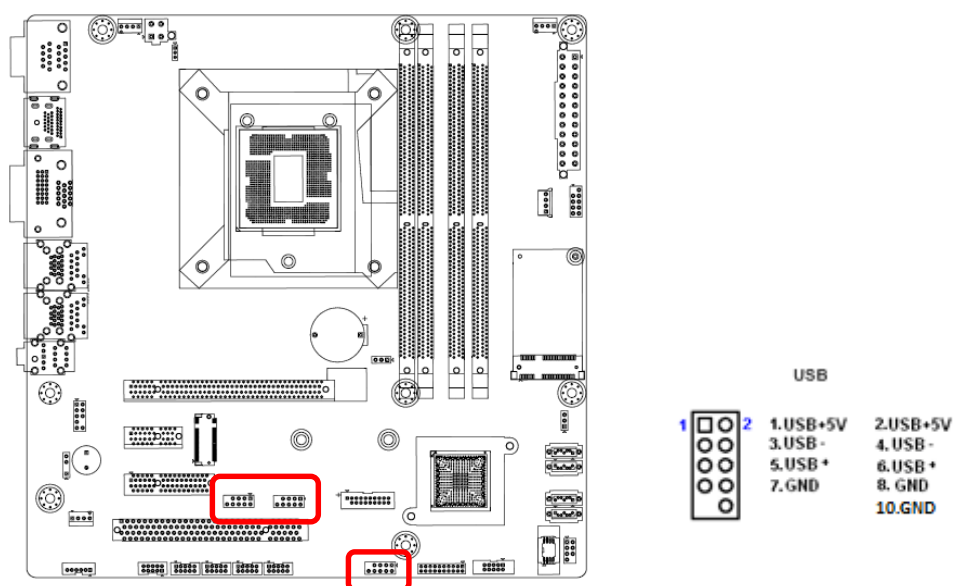
1.7.6 Serial ATA Connector (SATA1~4)

SATA 1~6 support SATA 3.0. and SATA 6 is shared by M.2 slot. These connectors are for the Serial ATA signal cables for Serial ATA hard disk drives.



1.7.7 USB connectors (USB78, USB910, USB1112)

These connectors are for USB 2.0 ports. Connect the optional USB module cable to any of these connectors, then install the module to a slot opening at the back of the system chassis. These USB connectors comply with USB 2.0 specification that supports up to 480 Mbps connection speed.



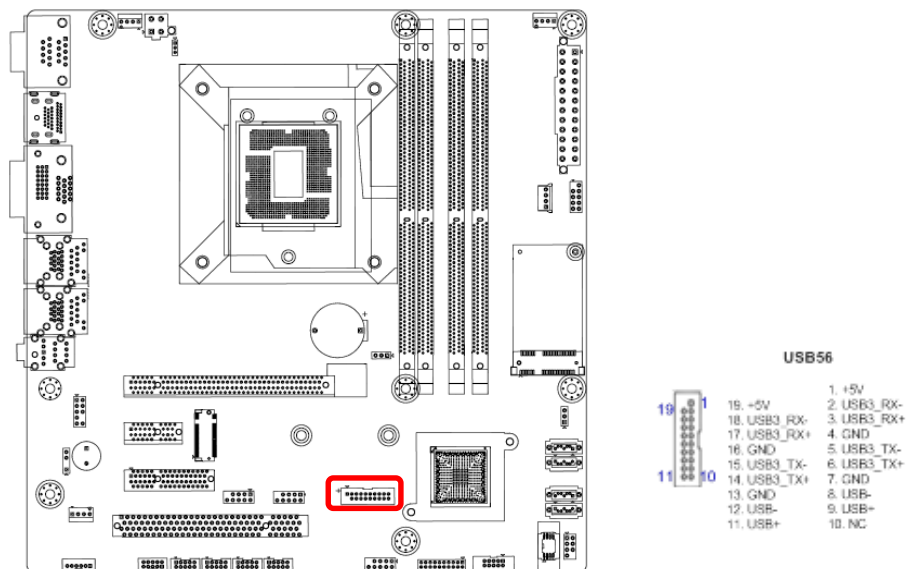
Never connect a 1394 cable to the USB connectors.
Doing so will damage the motherboard!



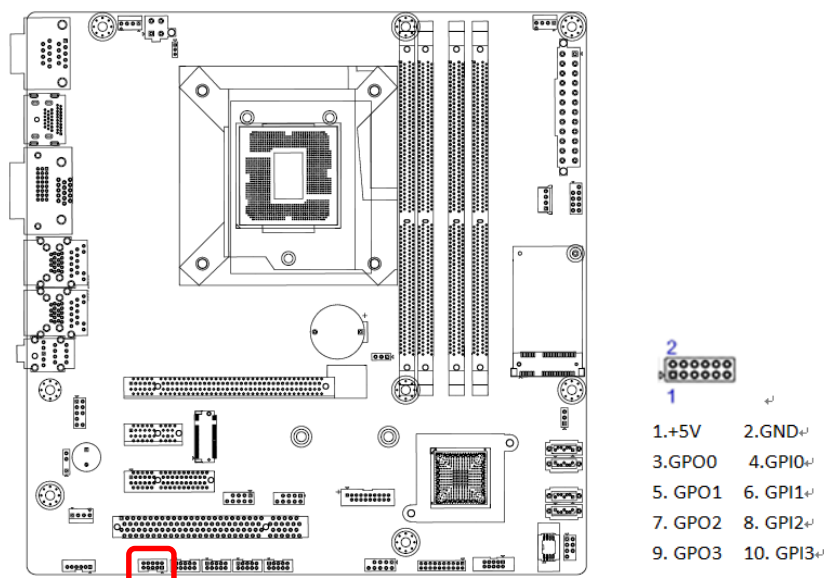
The USB module is purchased separately.

1.7.8 USB3.0 connector (USB56)

This connector provides 2 USB3.0 port. Connect the optional USB module cable to any of these connectors, then install the module to a slot opening at the back of the system chassis. These USB connectors comply with USB 3.0 specification that supports up to 5Gbps connection speed.

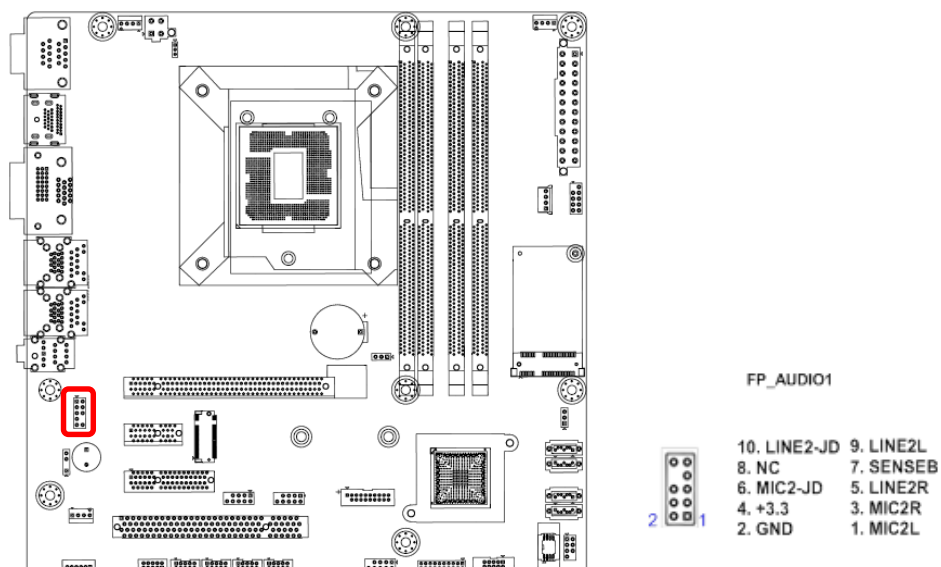


1.7.9 8 bit GPIO header (JDIO1)

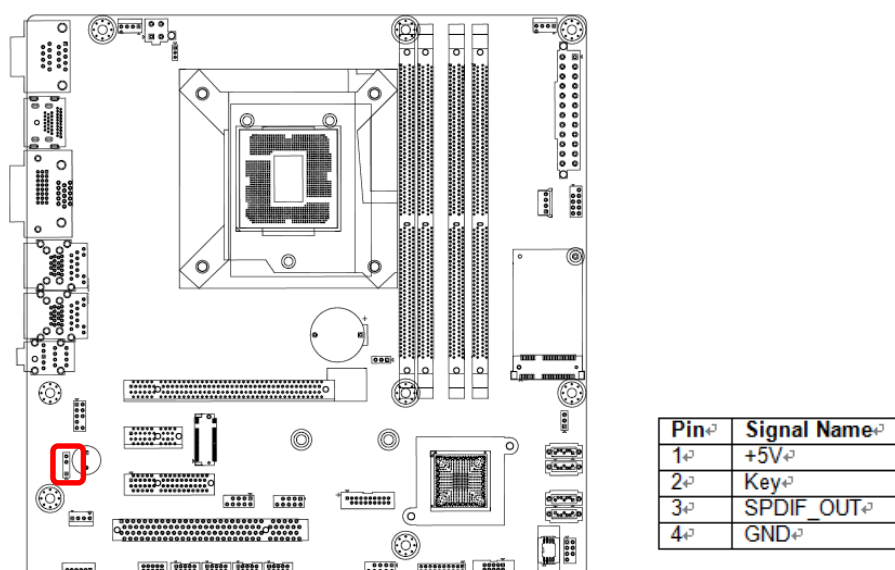


1.7.10 Front Audio connector (FP_AUDIO1)

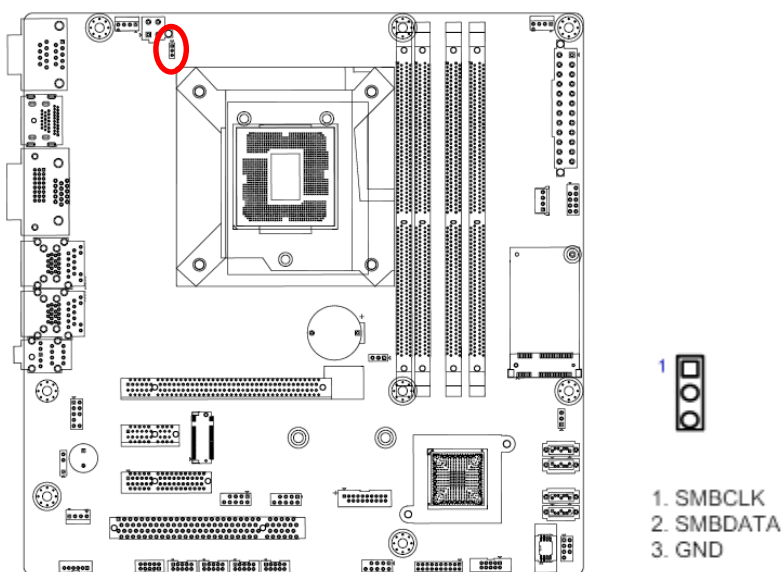
This connector is for a chassis-mounted front panel audio I/O module that supports either HD Audio or legacy AC '97 (optional) audio standard.



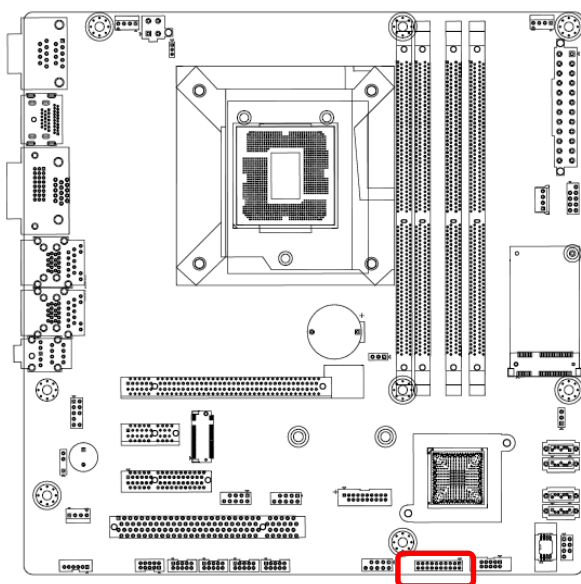
1.7.11 SPDIF Connector (SPDIF1)



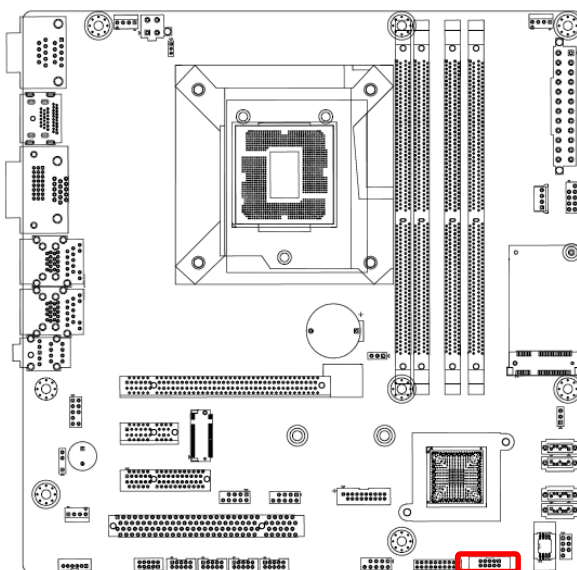
1.7.12 SM bus connector (JSMB1)



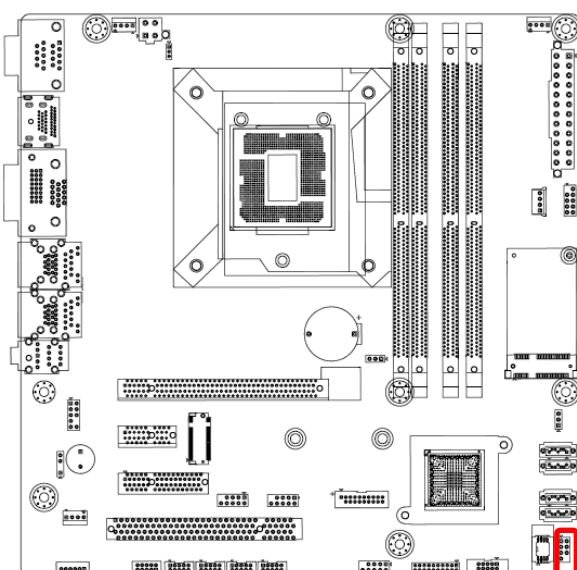
1.7.13 TPM connector (TPM1)



1.7.14 LPC connector (JLPC1)



1.7.15 SPI connector (SPI1)



Chapter 2

BIOS Setup

This chapter tells how to change the system settings through the BIOS Setup menus. Detailed descriptions of the BIOS parameters are also provided.

2.1 BIOS Setup Program

This motherboard supports a programmable firmware chip that you can update using the provided utility. Use the BIOS Setup program when you are installing a motherboard, reconfiguring your system, or prompted to "Run Setup." This section explains how to configure your system using this utility.

Even if you are not prompted to use the Setup program, you can change the configuration of your computer in the future. For example, you can enable the security password feature or change the power management settings. This requires you to reconfigure your system using the BIOS Setup program so that the computer can recognize these changes and record them in the CMOS RAM of the firmware hub.

The firmware hub on the motherboard stores the Setup utility. When you start up the computer, the system provides you with the opportunity to run this program. Press during the Power-On-Self-Test (POST) to enter the Setup utility; otherwise, POST continues with its test routines.

If you wish to enter Setup after POST, restart the system by pressing <Ctrl+Alt+Delete>, or by pressing the reset button on the system chassis. You can also restart by turning the system off and then back on. Do this last option only if the first two failed.

The Setup program is designed to make it as easy to use as possible. Being a menu-driven program, it lets you scroll through the various sub-menus and make your selections from the available options using the navigation keys.



- The default BIOS settings for this motherboard apply for most conditions to ensure optimum performance. If the system becomes unstable after changing any BIOS settings, load the default settings to ensure system compatibility and stability. Select the Load Optimized Defaults from the BIOS menu screen.
- The BIOS setup screens shown in this section are for reference purposes only, and may not exactly match what you see on your screen.
- Visit the system builder's website to download the latest BIOS file for this motherboard.

2.1.1 Legend Box

The keys in the leg end bar allow you to navigate through the various setup menus

Key(s)	Function Description
→←	Select Screen
↑↓	Select Item
Enter	Select
+ -	Change Opt.
F1	General Help
F2	Previous Values
F3	Optimal Defaults
F4	Save and Exit
ESC	Exit

2.1.2 List Box

This box appears only in the opening screen. The box displays an initial list of configurable items in the menu you selected.

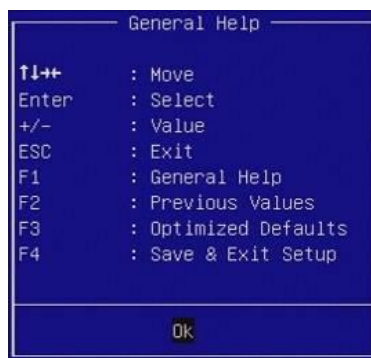
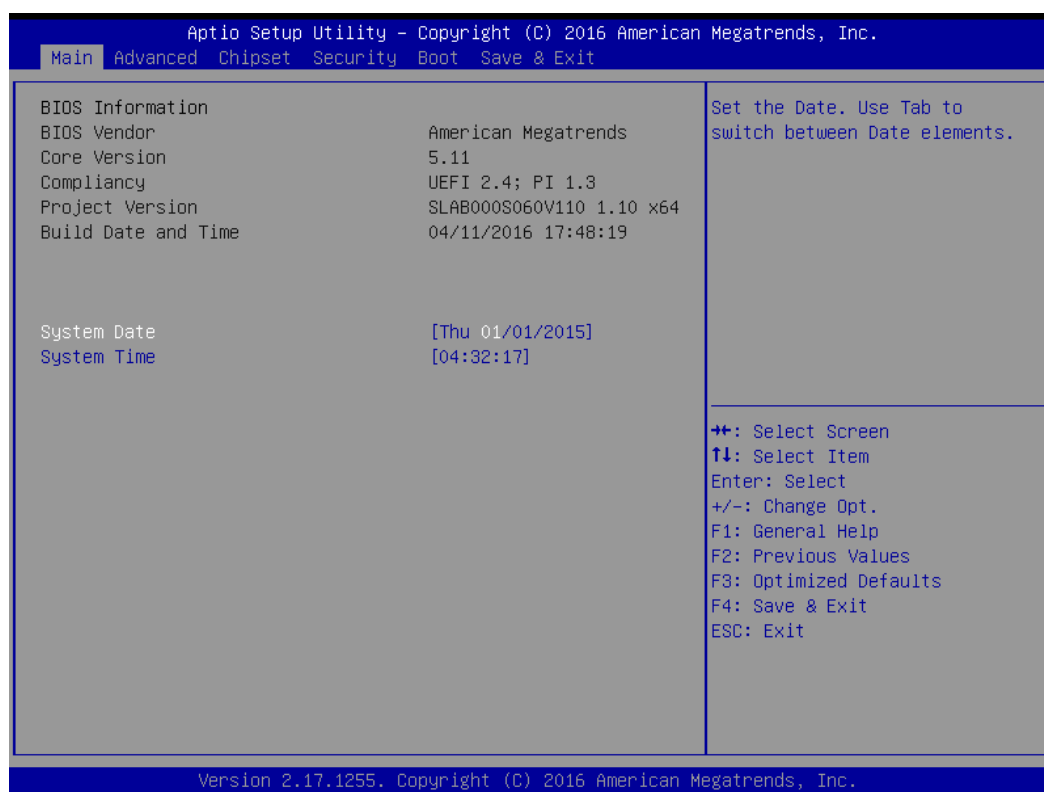
2.1.3 Sub-menu

Note that a right pointer symbol (▶) appears to the left of certain fields. This pointer indicates that you can display a sub-menu from this field. A sub-menu contains additional options for a field parameter. To display a sub-menu, move the highlight to the field and press <Enter>. The sub-menu appears. Use the legend keys to enter values and move from field to field within a sub-menu as you would within a menu. Use the <Esc> key to return to the main menu.

Take some time to familiarize yourself with the legend keys and their corresponding functions. Practice navigating through the various menus and submenus. If you accidentally make unwanted changes to any of the fields, press <F3> to load the optimal default values. While moving around through the Setup program, note that explanations appear in the Item Specific Help window located to the right of each menu. This window displays the help text for the currently highlighted field.

2.2 BIOS Menu Screen

When you enter the BIOS, the following screen appears. The BIOS menu screen displays the items that allow you to make changes to the system configuration. To access the menu items, press the up/down/right/left arrow key on the keyboard until the desired item is highlighted, then press [Enter] to open the specific menu.



2.3 Main Setup

This menu gives you an overview of the general system specifications. The BIOS automatically detects the items in this menu. Use this menu for basic system configurations, such as time, date etc.



BIOS Information

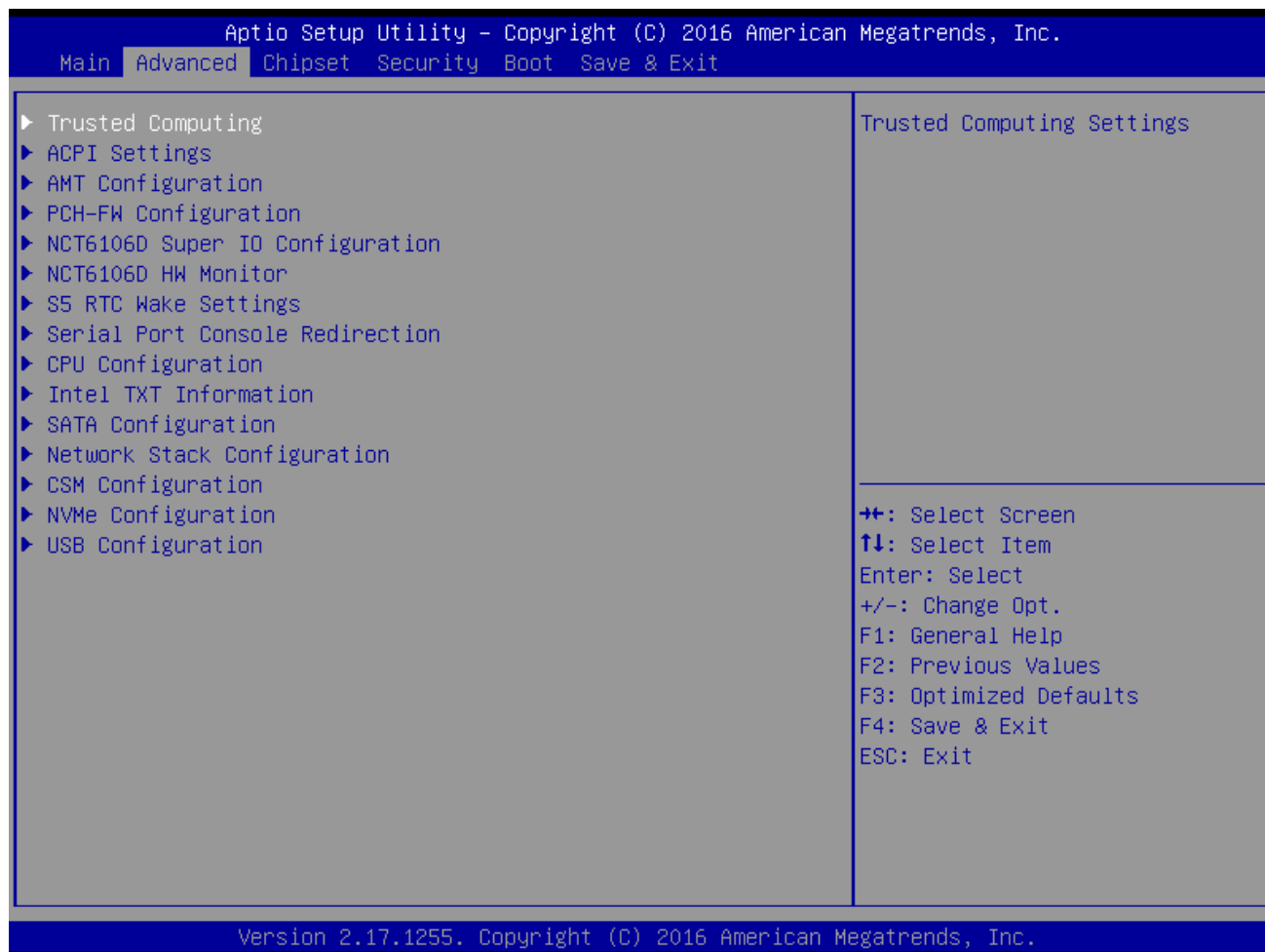
Displays the auto-detected BIOS information.

- **System Date**
The date format is <Date>,<Month>,<Day>,<Year>.
- **System Time**
The time format is <Hour>,<Minute>,<Second>.

2.4 Advanced BIOS Setup

Select the Advanced tab from the setup screen to enter the Advanced BIOS Setup screen.

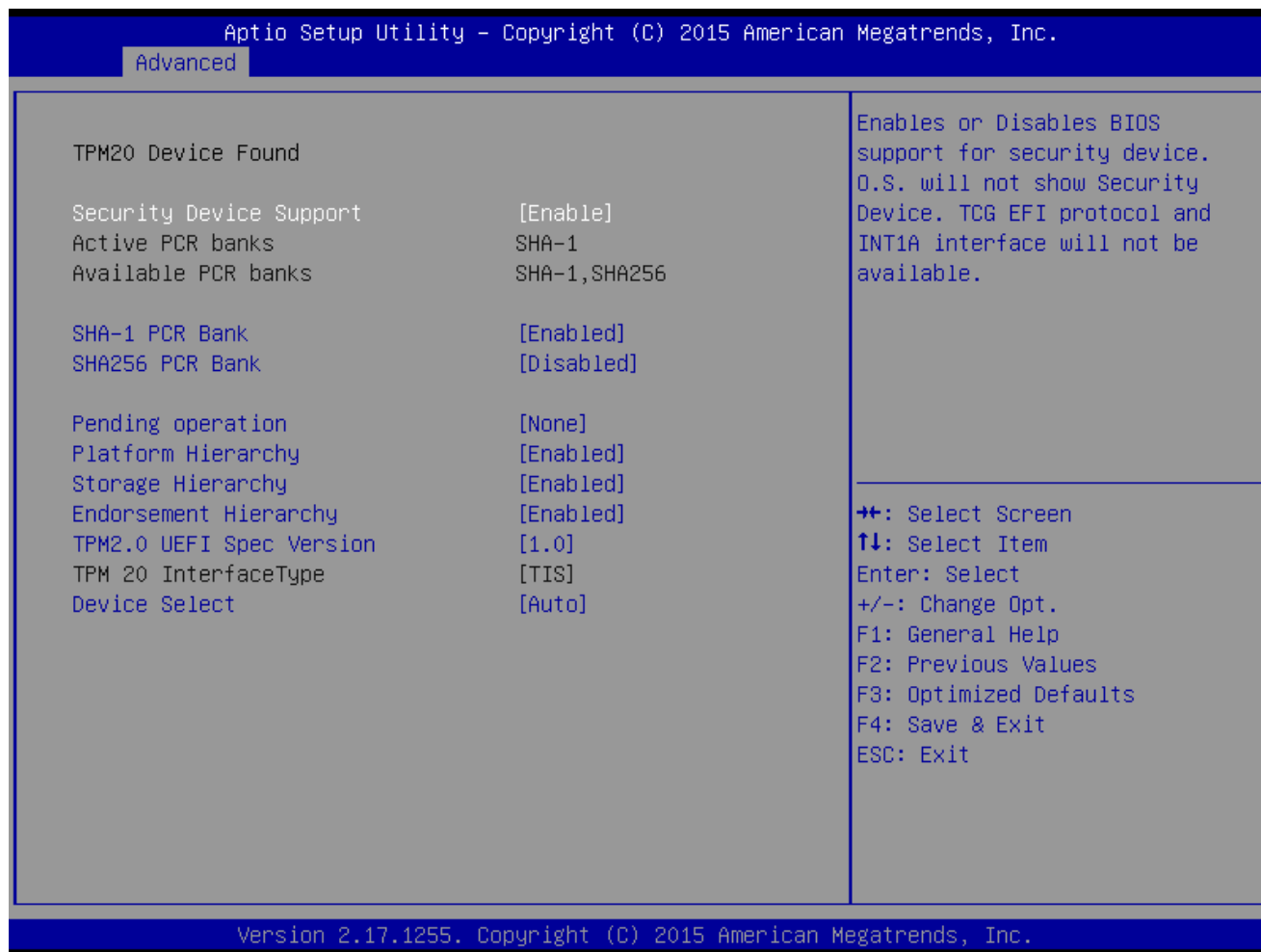
You can select any of the items in the left frame of the screen, such as Chipset configuration, to go to the sub menu for that item. You can display an Advanced BIOS Setup option by highlighting it using the <Arrow> keys. All Advanced BIOS Setup options are described in this section. The Advanced BIOS Setup screen is shown below. The sub menus are described on the following pages.



Take caution when changing the settings of the Advanced menu items. Incorrect field values can cause the system to malfunction.

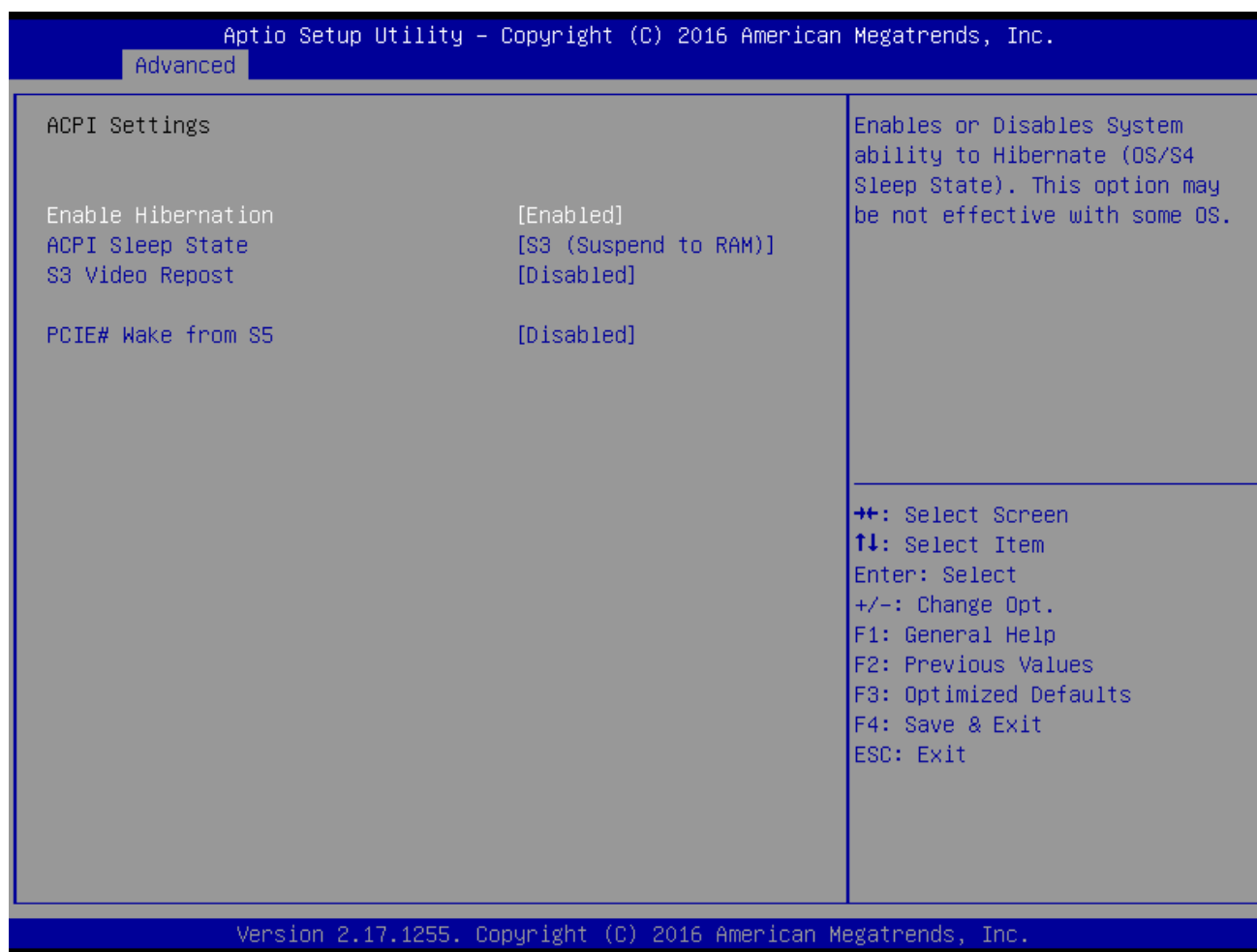
2.4.1 Trusted Computing (optional)

Security device settings



- **Security Device Support [Enable]**
Enable or Disable BIOS support for security device.
Configuration options: [Enable] [Disable]
- **SHA-1 PCR Bank [Enable]**
Enable or Disable SHA-1 PCR Bank.
Configuration options: [Enable] [Disable]
- **SHA256 PCR Bank [Disable]**
Enable or Disable SHA256 PCR Bank.
Configuration options: [Enable] [Disable]
- **Pending Operation [None]**
Schedule and operation for the Security Device.
Configuration options: [None] [TPM clear]
- **Platform Hierarchy [Enable]**
Enable or Disable Platform Hierarchy.
Configuration options: [Enable] [Disable]
- **Storage Hierarchy [Enable]**
Enable or Disable Storage Hierarchy.
Configuration options: [Enable] [Disable]
- **Endorsement Hierarchy [Enable]**
Enable or Disable Endorsement Hierarchy.
Configuration options: [Enable] [Disable]
- **TPM2.0 UEFI Spec Version[1.0]**
Select TCG2 spec version: 1.0: the compatibility mode for Win8/Win10; 1.x: For TCG2 newer spec for Win10
Configuration options: [1.0] [1.x]
- **Device Select[Auto]**
Select TPM device version
Configuration options: [TPM1.2] [TPM1.0] [Auto]

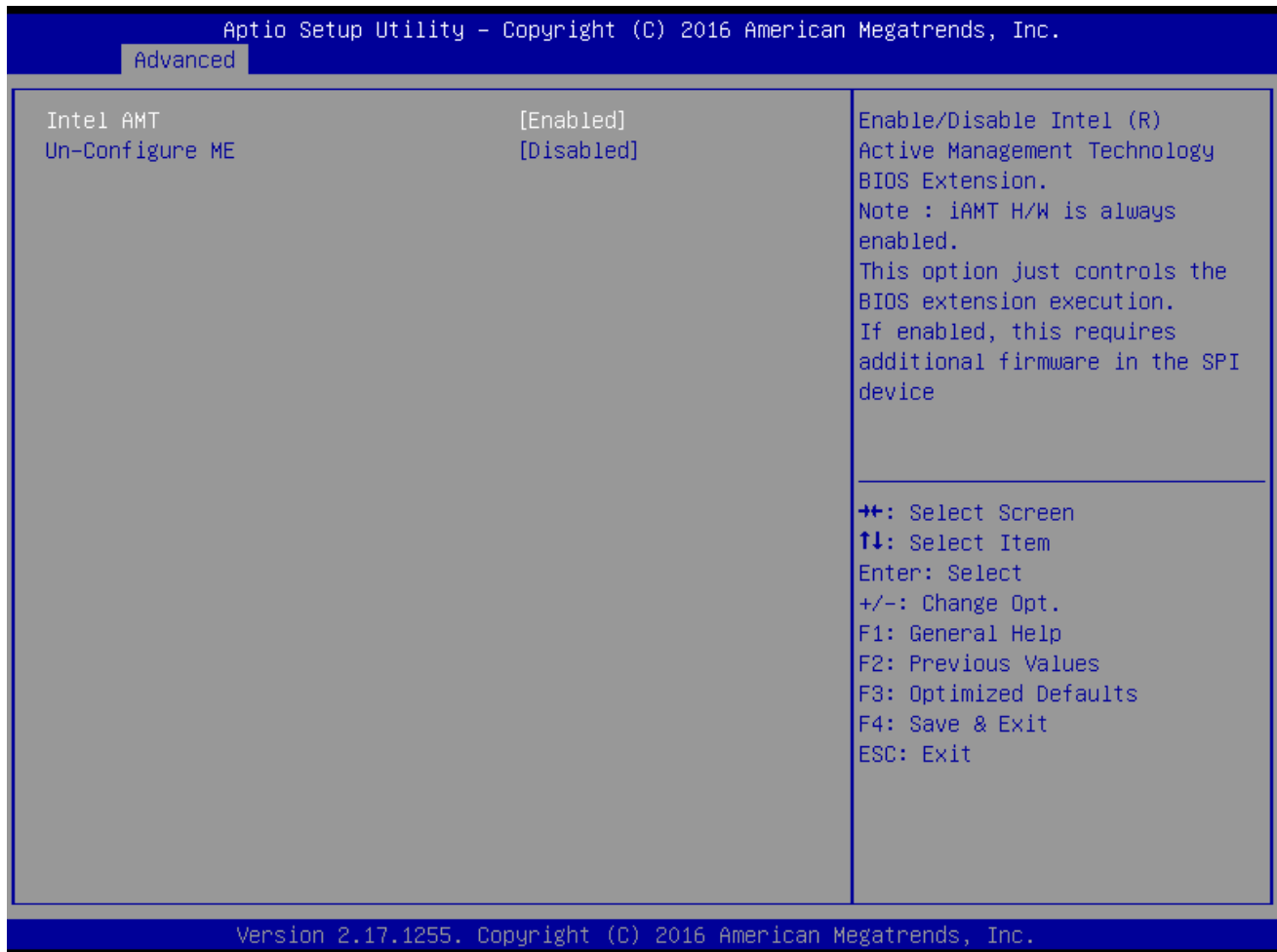
2.4.2 ACPI Settings



- **Enable Hibernation [Enable]**
Enable or Disable system ability to Hibernation.
Configuration options: [Enable] [Disable]
- **ACPI Sleep State [S3 only (Suspend to RAM)]**
Select the highest ACPI sleep state the system will enter the SUSPEND button is press. Configuration options: [Suspend Disable] [S3 only(suspend to RAM)]
- **S3 Video Repost [Disabled]**
Enable or disable S3 video repost
Configuration options: [Disabled] [Enabled]
- **PCIE# wake from S5 [Disabled]**
Enable or disable PCIE wake the system from S5.
Configuration options: [Disabled] [Enabled]

2.4.3 AMT configuration

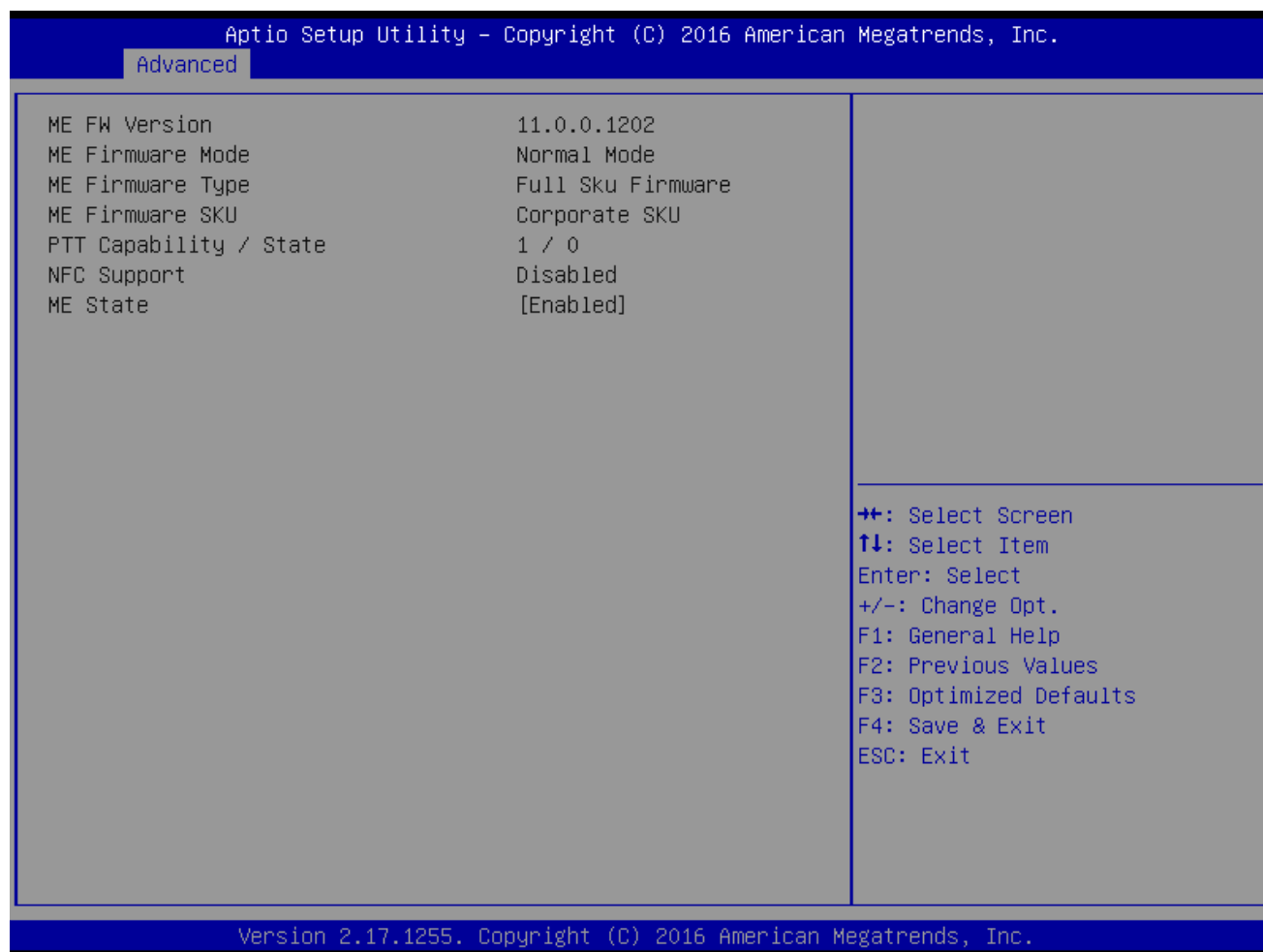
AMT Configuration settings



- **Intel AMT [Enable]**
Enable or Disable Intel AMT BIOS extension
Configuration options: [Disabled] [Enabled]
- **Un-Configure ME [Disable]**
Un-configure ME with Password
Configuration options: [Disabled] [Enabled]

2.4.4 PCH-FW configuration

ME firmware information



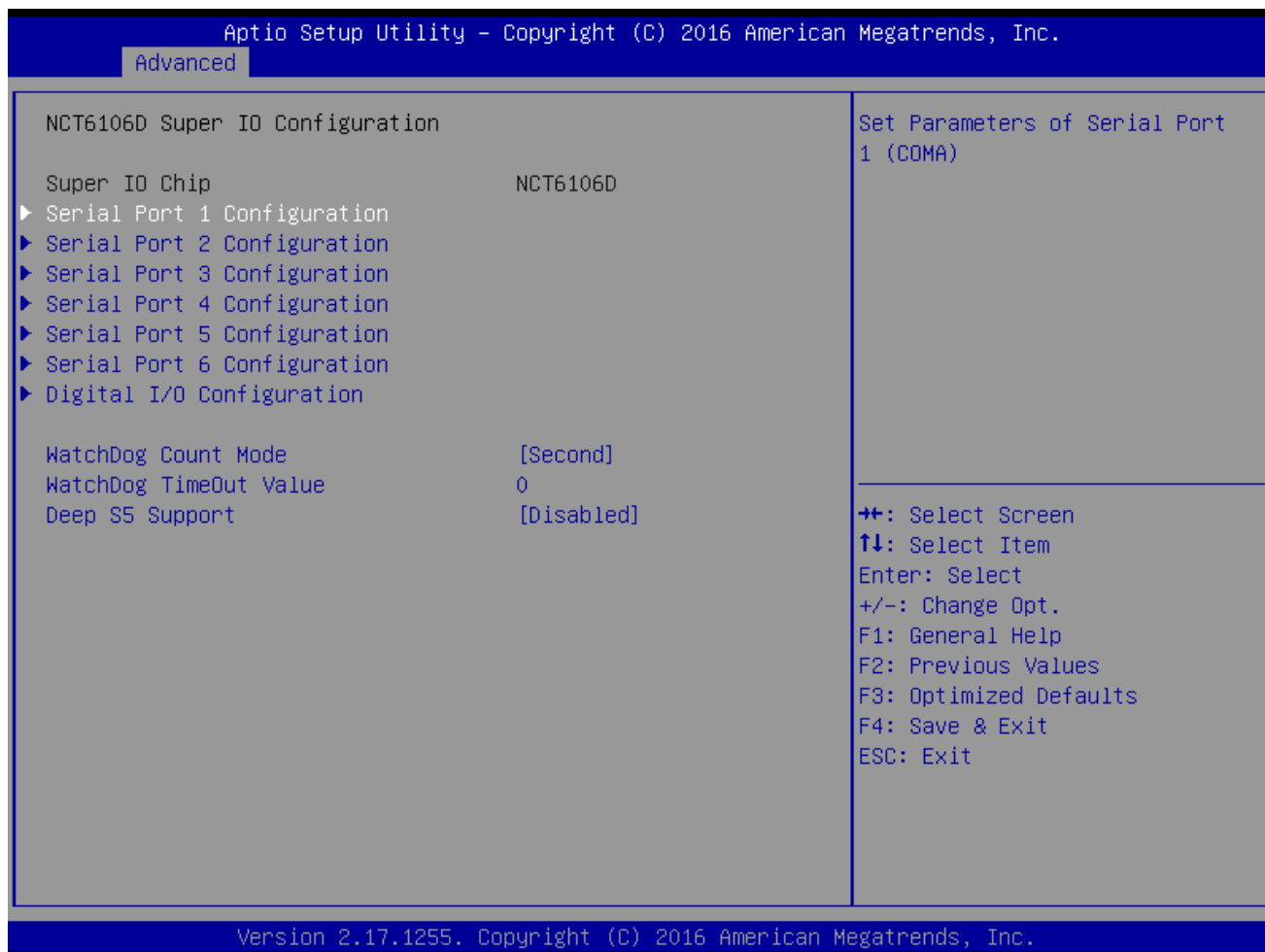
- **ME state [Enabled]**

Set ME to soft Temporary Disabled

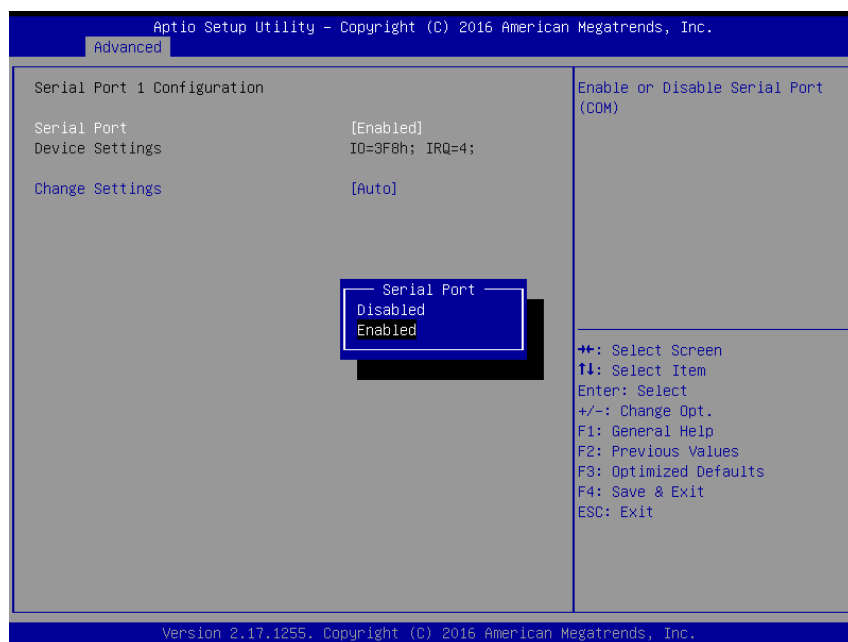
Configuration options: [Disabled] [Enabled]

2.4.5 NCT6106D Super IO configuration

Provide NCT6106D super IO configuration settings



1. Serial Port 1 Configuration



- **Serial Port [Enabled]**

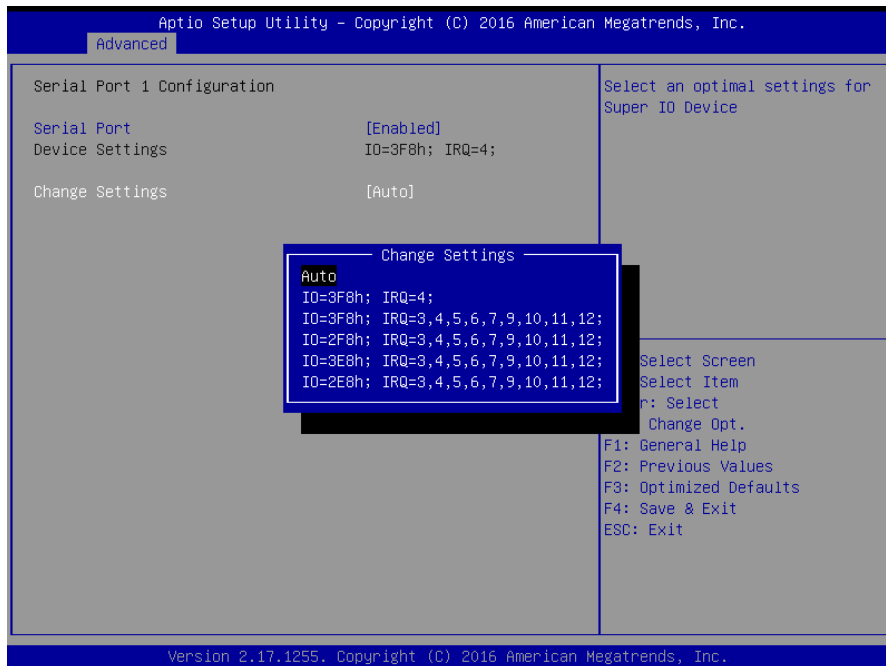
Enable or Disable serial Port (COM)

Configuration options: [Disabled] [Enabled]

- **Change Setting [Auto]**

Select an optimal settings for super IO device

Configuration options: as below



2. Serial Port 2 Configuration

- **Serial Port [Enabled]**

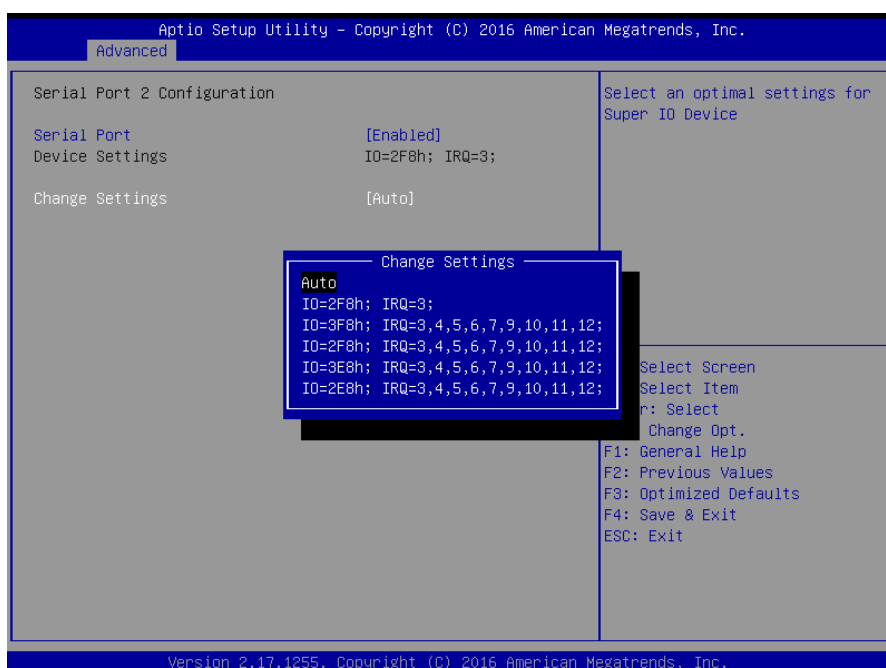
Enable or Disable serial Port (COM)

Configuration options: [Disabled] [Enabled]

- **Change Settings [Auto]**

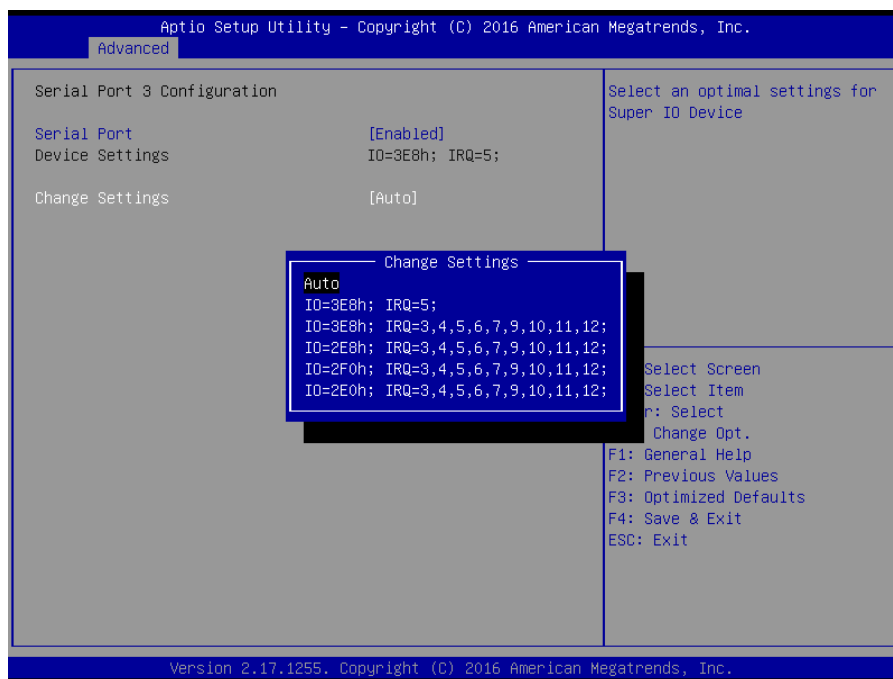
Select an optimal settings for super IO device

Configuration options: as below



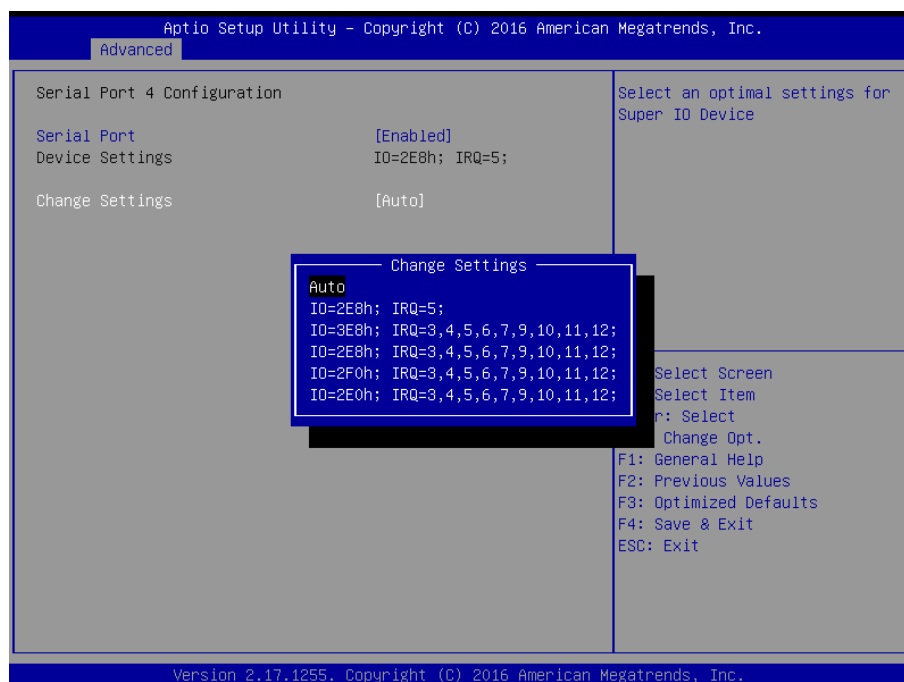
3. Serial Port 3 Configuration

- **Serial Port [Enabled]**
Enable or Disable serial Port (COM)
Configuration options: [Disabled] [Enabled]
- **Change Settings [Auto]**
Select an optimal settings for super IO device
Configuration options: as below



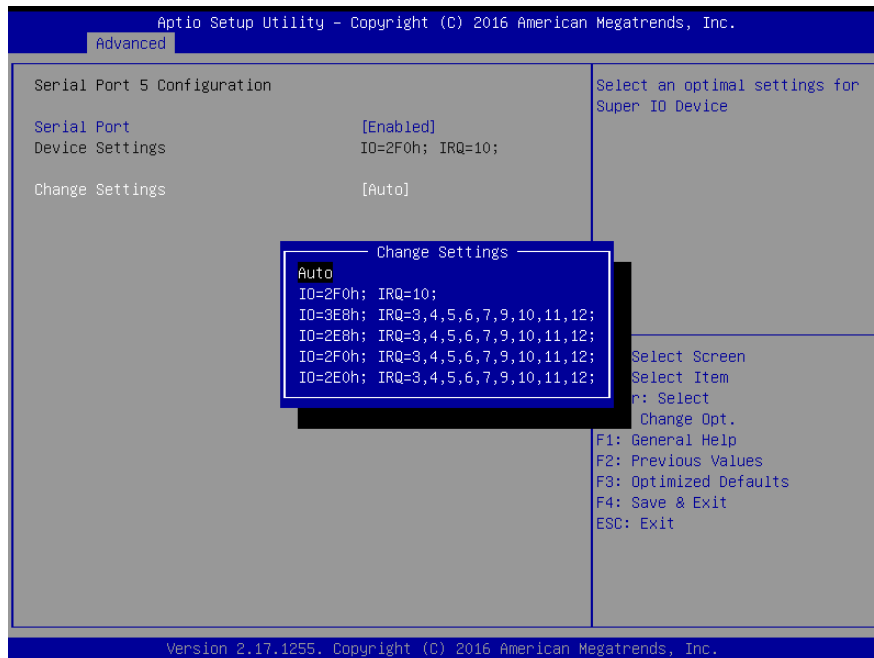
4. Serial Port 4 Configuration

- **Serial Port [Enabled]**
Enable or Disable serial Port (COM)
Configuration options: [Disabled] [Enabled]
- **Change Settings [Auto]**
Select an optimal settings for super IO device
Configuration options: as below



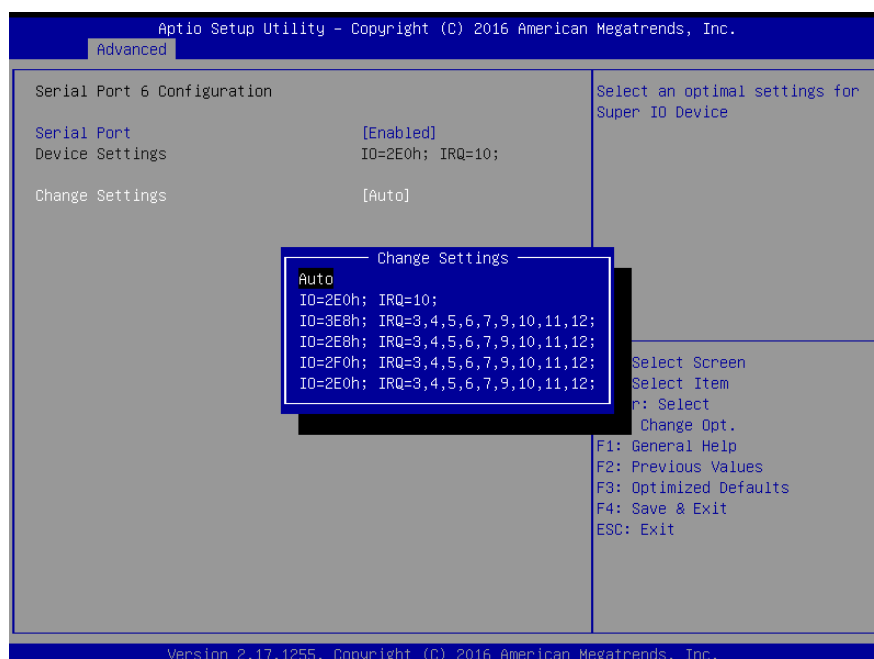
5. Serial Port 5 Configuration

- **Serial Port [Enabled]**
Enable or Disable serial Port (COM)
Configuration options: [Disabled] [Enabled]
- **Change Settings [Auto]**
Select an optimal settings for super IO device
Configuration options: as below



6. Serial Port 6 Configuration

- **Serial Port [Enabled]**
Enable or Disable serial Port (COM)
Configuration options: [Disabled] [Enabled]
- **Change Settings [Auto]**
Select an optimal settings for super IO device
Configuration options: as below

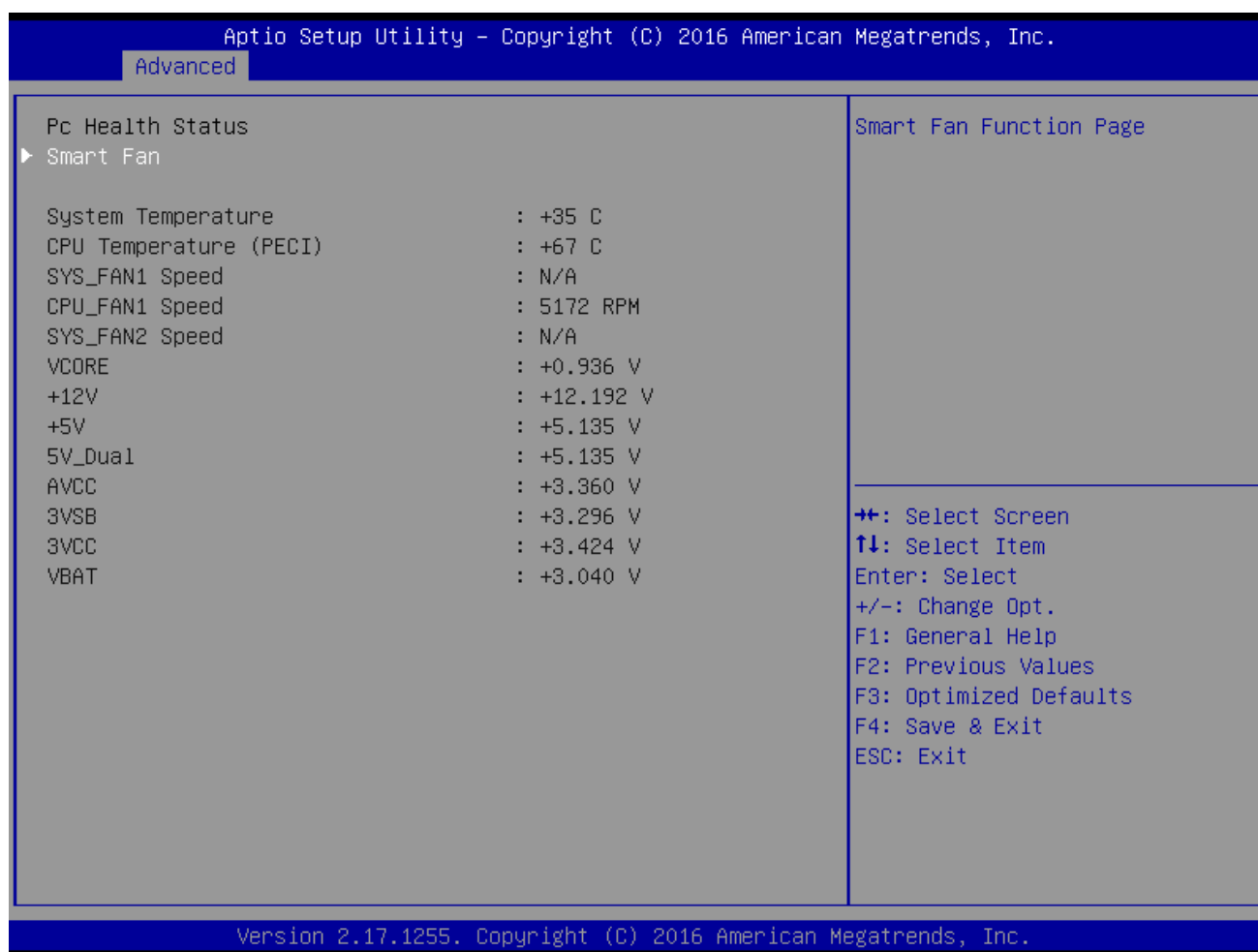


7. DIO Port Configuration

- **WatchDog count mode [Second]**
WatchDog count mode Selection
Configuration options: [Second] [Minute]
- **WatchDog Timeout value**
Fill watchdog timeout value, 0 means disables
- **Deep S5 Support [Disabled]**
Select deep S5 support enabled to Disabled
Configuration options: [Disabled] [Enabled]

2.4.6 NCT6106D HW monitor

Display Hardware monitor information



2.4.7 S5 RTC wake settings



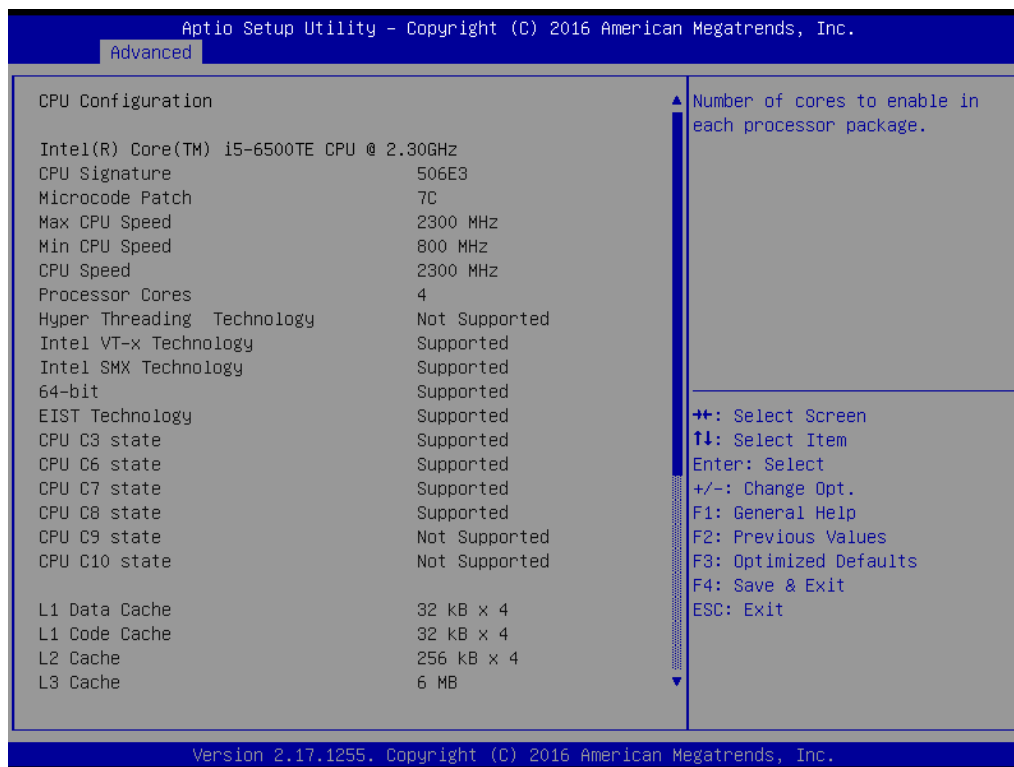
- **Wake system from S5 [Disabled]**

Enabled or Disabled system wake on alarm event

Configuration options: [Enabled] [Disabled]

2.4.8 CPU configuration

Display CPU configuration



- **Hyper-Threading [Enabled]**

Enabled or Disabled the hyper threading of Intel CPU

Configuration options: [Disabled][Enabled]

This depends on CPU sku.

- **Active Processor Core [All]**

Number of Cores to enable in each processor package

Configuration options: [all] [1][2][3][4]

This depends on CPU sku.

- **Intel® Virtualization Technology [Enabled]**

When enabled, a VMM can utilize the additional hardware capabilities provided by vanderpool Technology

Configuration options: [Disabled][Enabled]

- **Intel® SpeedStep™ [Enabled]**

Allow more than two frequency ranges to be supported.

Configuration options: [Disabled][Enabled]

- **Turbo mode [Enabled]**

Enable or disable Turbo mode

Configuration options: [Enabled] [Disabled]

- **CPU C states [Enabled]**

Enable or disable CPU C states

Configuration options: [Enabled] [Disabled]

- **Enhanced C-states [Enabled]**

Enable or disable C1E. When enabled, CPU will switch to minimum speed when all cores enter C-state.

Configuration options: [Enabled] [Disabled]

- **Package C state limit [Auto]**

Package C state limit

Configuration options:

[C0/C1][C2][C3][C6][C7][C7s][C8][Auto]

- **Intel TXT(LT) Support [Disabled]**

Enable or disable Intel TXT support

Configuration options: [Enabled] [Disabled]

- **SW Guard Extensions(SGX) [software controlled]**

Enable or disables Guard Extensions

Configuration

options:[Disabled][Enabled][Software Controlled]

- **Select owner EPOCH input type [No change in owner EPOCHs]**

After user enters EPOCH values manually, the values will not be visible for security reasons

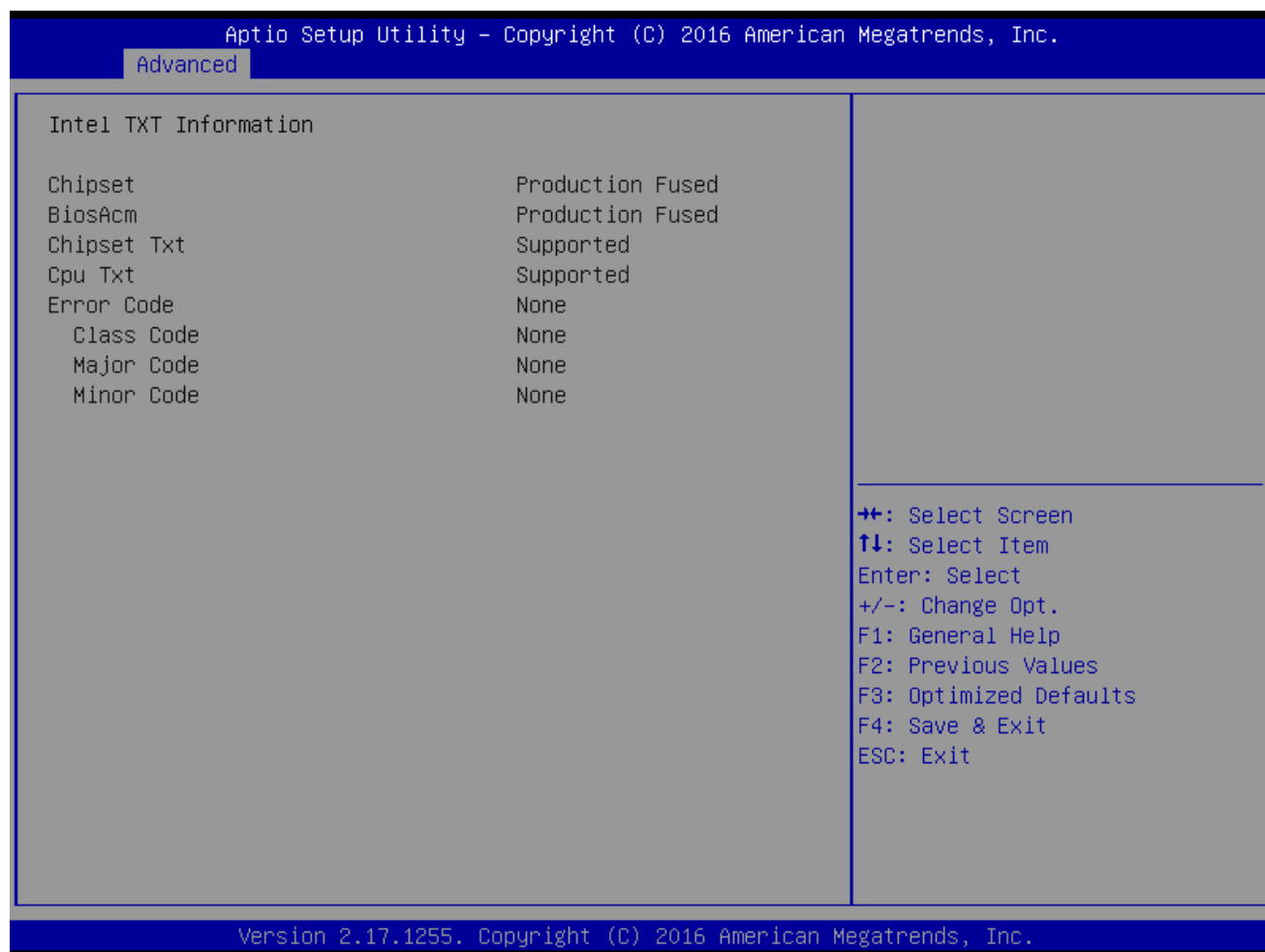
Configuration options:[No change in owner

EPOCHs][change to new random owner

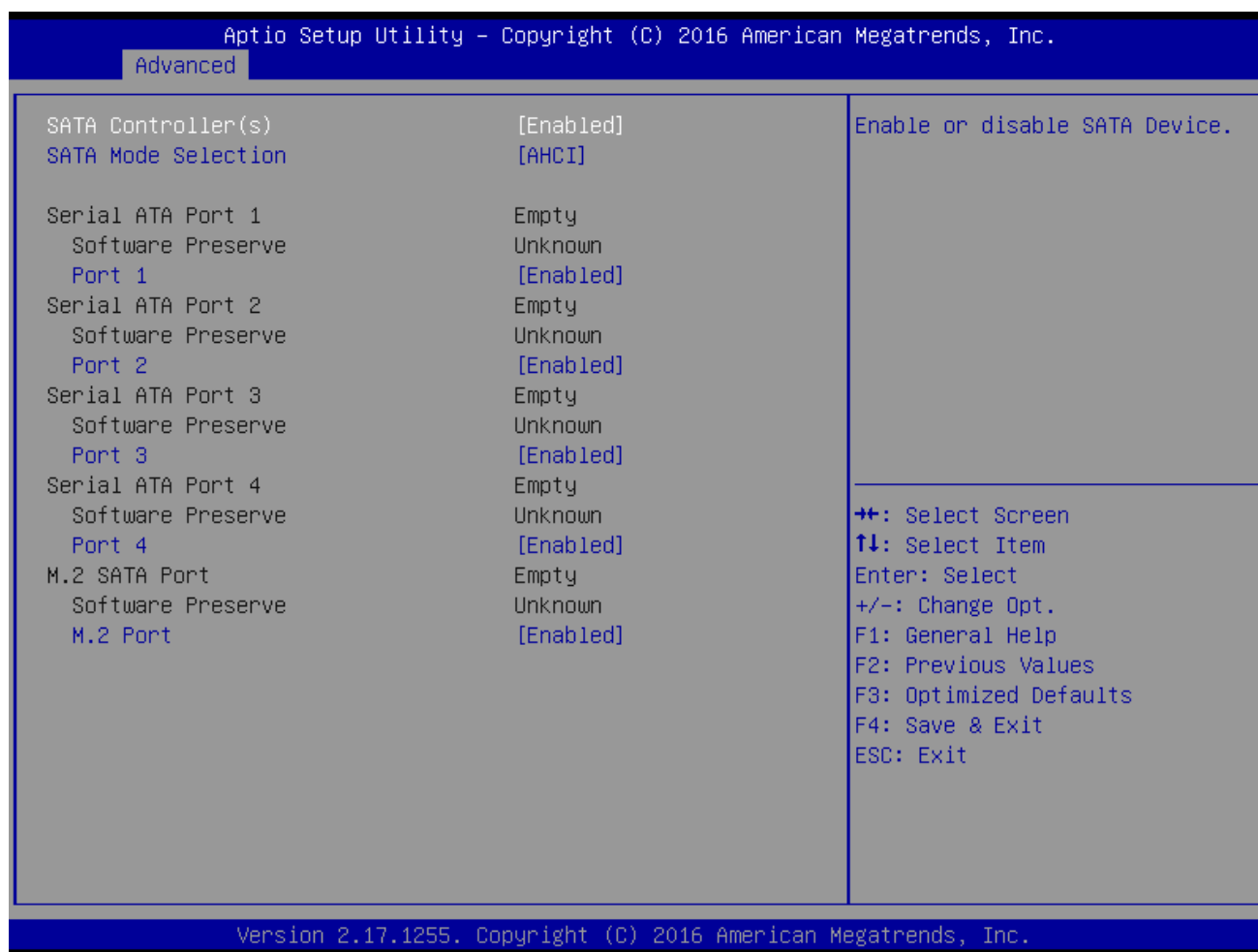
EPOCHs][Manual user defined owner EPOCHs]

2.4.9 Intel TXT information

Display Intel TXT information

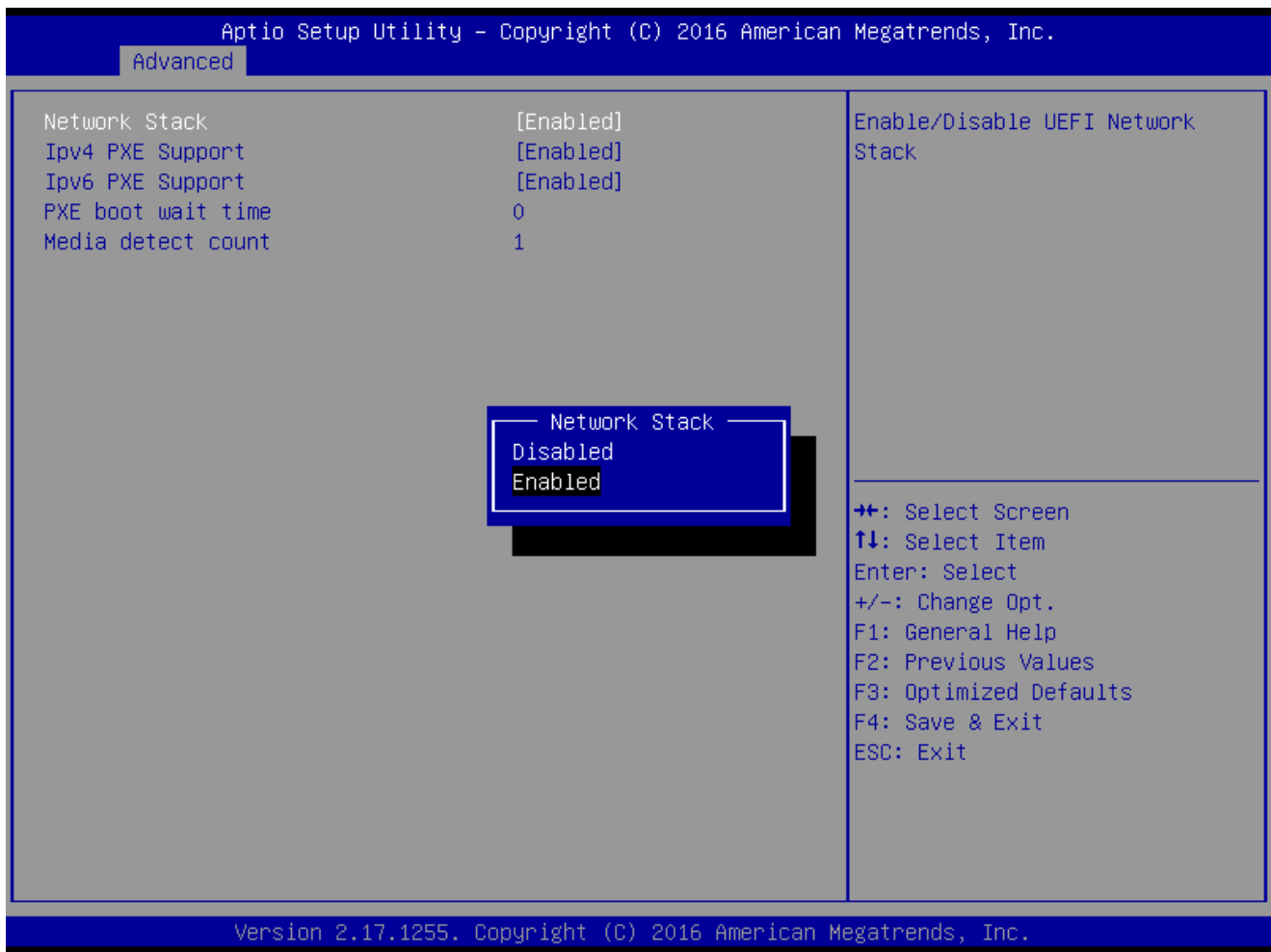


2.4.10 SATA Configuration



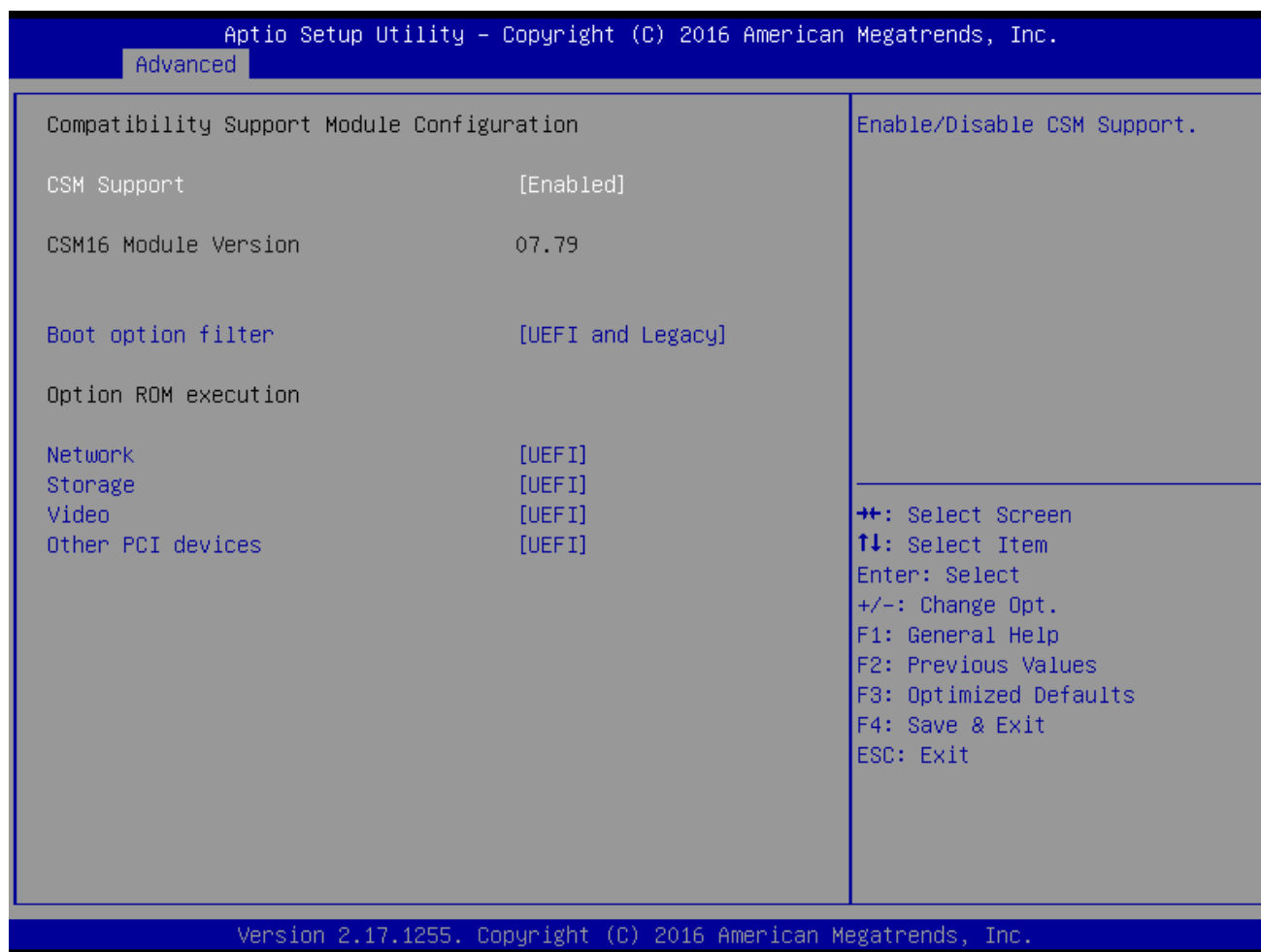
- **SATA Controller [Enabled]**
Enable or Disable SATA device
Configuration options: [Enabled][Disabled]
- **SATA Mode Selection [AHCI]**
Determines how SATA controller operate
Configuration options: [AHCI][RAID]
- **Port 1 [Enabled]**
Enable or Disable SATA port 1
Configuration options: [Enabled][Disabled]
- **Hot Plug [Disabled]**
Designates this port as Hot Pluggable
Configuration options: [Disabled][Enabled]
- **Port 2 [Enabled]**
Enable or Disable SATA port 2
Configuration options: [Enabled][Disabled]
- **Hot Plug [Disabled]**
Designates this port as Hot Pluggable
Configuration options: [Disabled][Enabled]
- **Port 3 [Enabled]**
Enable or Disable SATA port 3
Configuration options: [Enabled][Disabled]
- **Hot Plug [Disabled]**
Designates this port as Hot Pluggable
Configuration options: [Disabled][Enabled]
- **Port 4 [Enabled]**
Enable or Disable SATA port 4
Configuration options: [Enabled][Disabled]
- **Hot Plug [Disabled]**
Designates this port as Hot Pluggable
Configuration options: [Disabled][Enabled]
- **M.2 [Enabled]**
Enable or Disable M.2 port
Configuration options: [Enabled][Disabled]
- **Hot Plug [Disabled]**
Designates this port as Hot Pluggable
Configuration options: [Disabled][Enabled]

2.4.11 Network Stack Configuration



- **Network Stack [Disabled]**
Enabled or disabled UEFI Network Stack
Configuration options: [Disabled] [Enabled]
- **Ipv4 PXE Support [Enabled]**
Enabled IPv4 PXE boot support
Configuration options: [Disabled] [Enabled]
- **Ipv6 PXE Support [Enabled]**
Enabled IPv6 PXE boot support
Configuration options: [Disabled] [Enabled]
- **PXE boot wait time**
Wait time to press ESC to abort the PXE boot
- **Media Detect Count**
Number of times presence of media will be checked

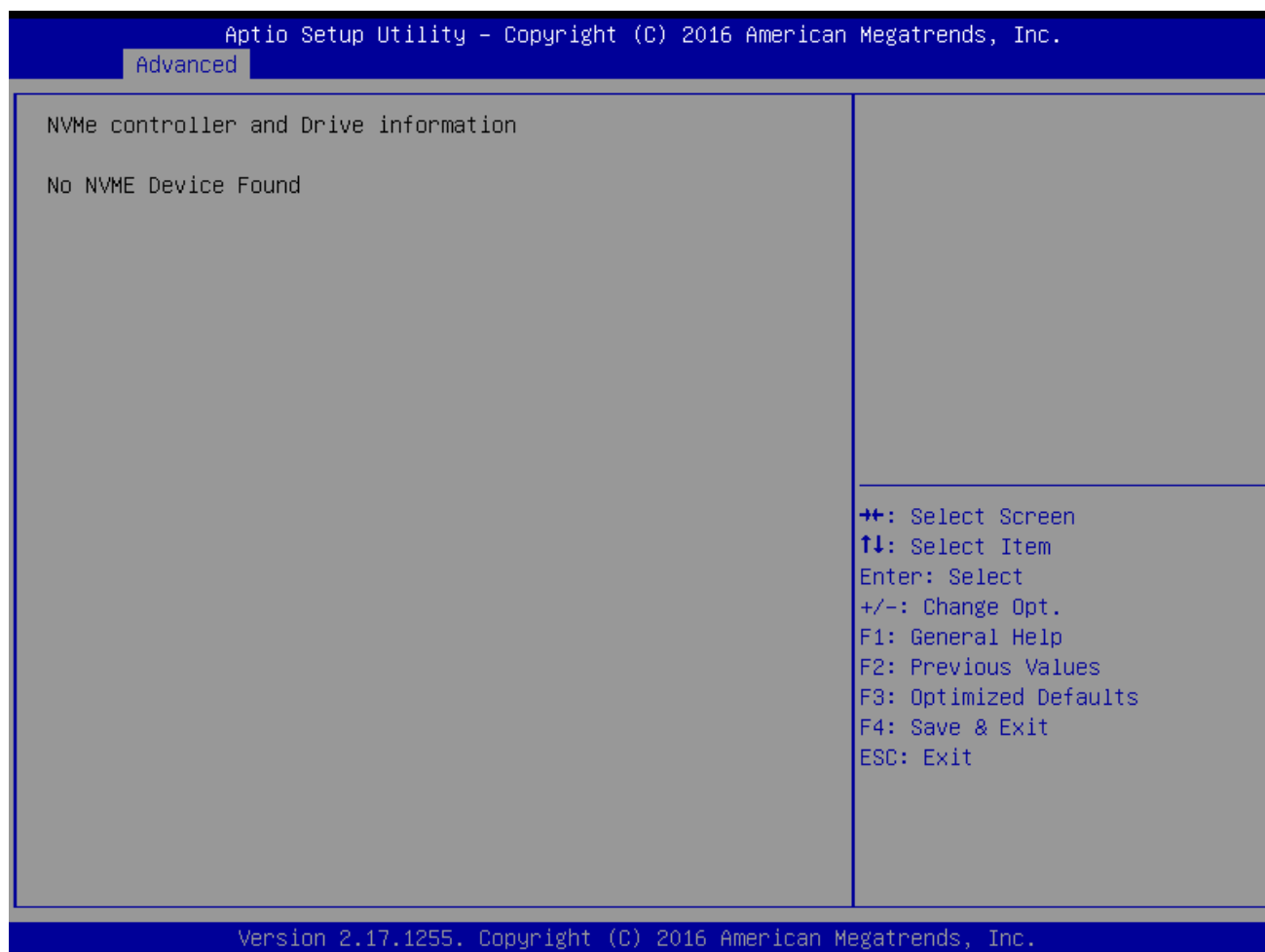
2.4.12 Compatibility Support Module Configuration



- CSM Support [Enabled]**
 Enabled or disabled CSM Support
 Configuration options: [Disabled] [Enabled]
- Boot option Filter [UEFI Only]**
 This option controls Legacy/UEFI ROMs Priority
 Configuration options: [UEFI and Legacy] [Legacy Only][UEFI Only]
- Network [UEFI]**
 Control the execution of UEFI and Legacy PXE OpROM
 Configuration options: [Do not launch] [UEFI][Legacy]
- Storage [UEFI]**
 Control the execution of UEFI and Legacy Storage OpROM
 Configuration options: [Do not launch] [UEFI][Legacy]
- Video [UEFI]**
 Control the execution of UEFI and Legacy Video OpROM
 Configuration options: [Do not launch] [UEFI][Legacy]
- Other PCI devices [UEFI]**
 Determines OpROM execution policy for devices other than Network, Storage, or Video.
 Configuration options: [Do not launch] [UEFI][Legacy]

2.4.13 NVMe Configuration

Display NVMe controller or Drive information



2.4.14 USB Configuration

USB Configuration parameters



- **Legacy USB Support [Enabled]**

Enabled Legacy USB Support. Auto Option disables legacy support if no USB devices are connected. Disabled option will keep USB devices available only for EFI application.
Configuration options: [Disabled] [Enabled][Auto]

- **XHCI Hand-off [Enabled]**

This is a workaround for Oses without XHCI hand-off support. This XHCI ownership change should be claimed by XHCI drivers
Configuration options: [Disabled] [Enabled]

- **USB Mass storage Driver Support[Enabled]**

Enabled or Disabled USB Mass storage driver support.
Configuration options: [Disabled] [Enabled]

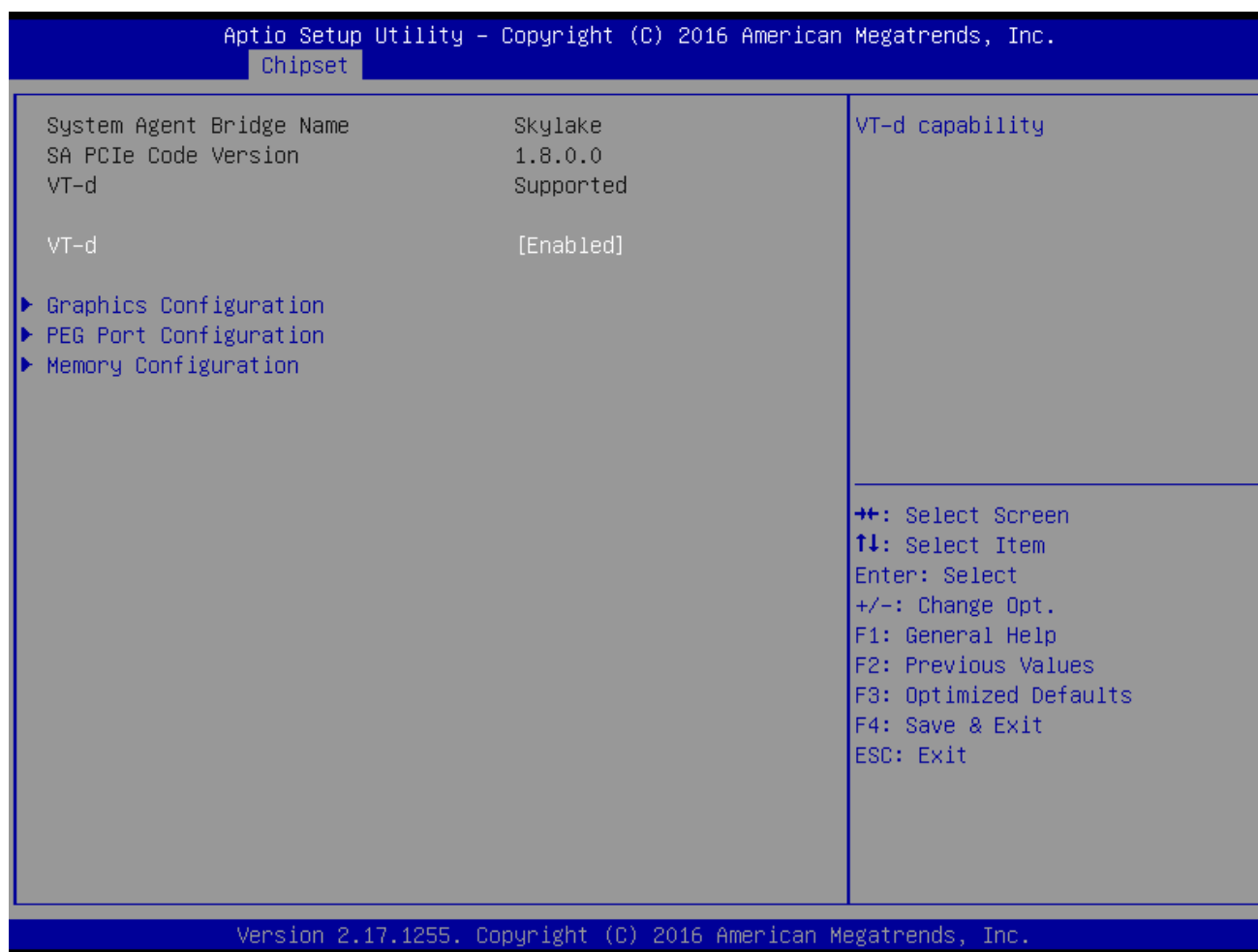
- **PMAP[Auto]**

Mass storage device emulation type. 'Auto' enumerates devices according to their media format. Optical drives are emulated as 'CDROM', drives with no media will be emulated according to a drive type.
Configuration options: [Auto] [Floppy][Forced FDD][hard Disk][CD-ROM]

2.5 Chipset



2.5.1 System Agent (SA) Configuration



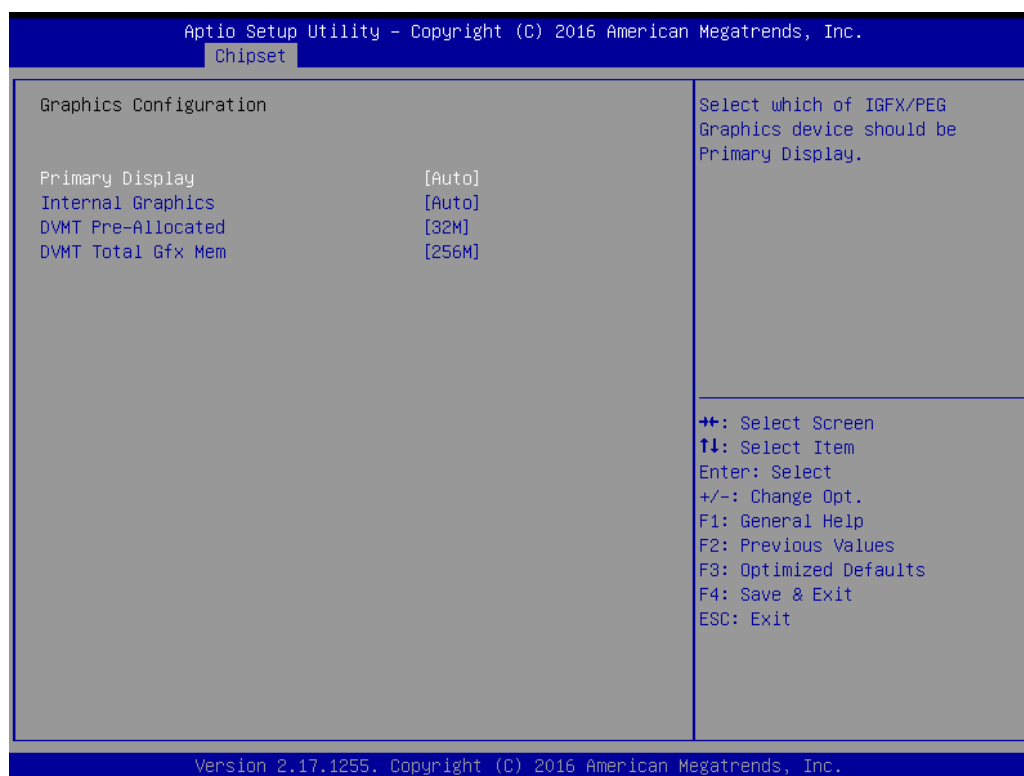
- **VT-d [Enabled]**

VT-d capability

Configuration options: [Disabled] [Enabled]

1. Graphic Configuration

Graphic configuration settings



- **Primary Display[Auto]**

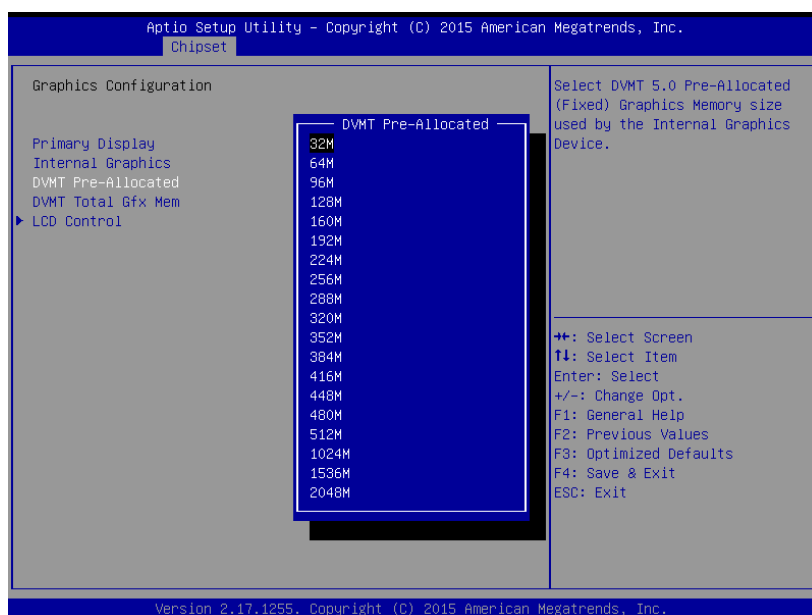
Select which of IGFX/PEG/PCI graphic device should be primary display or select SG for switchable Gfx. Configuration options: [Auto] [IGFX][PEG][PCIE]

- **Internal Graphics [Auto]**

Keep IGFX enabled based on the setup options
Configuration options: [Auto] [disabled][enabled]

- **DVMT Pre-allocated [32M]**

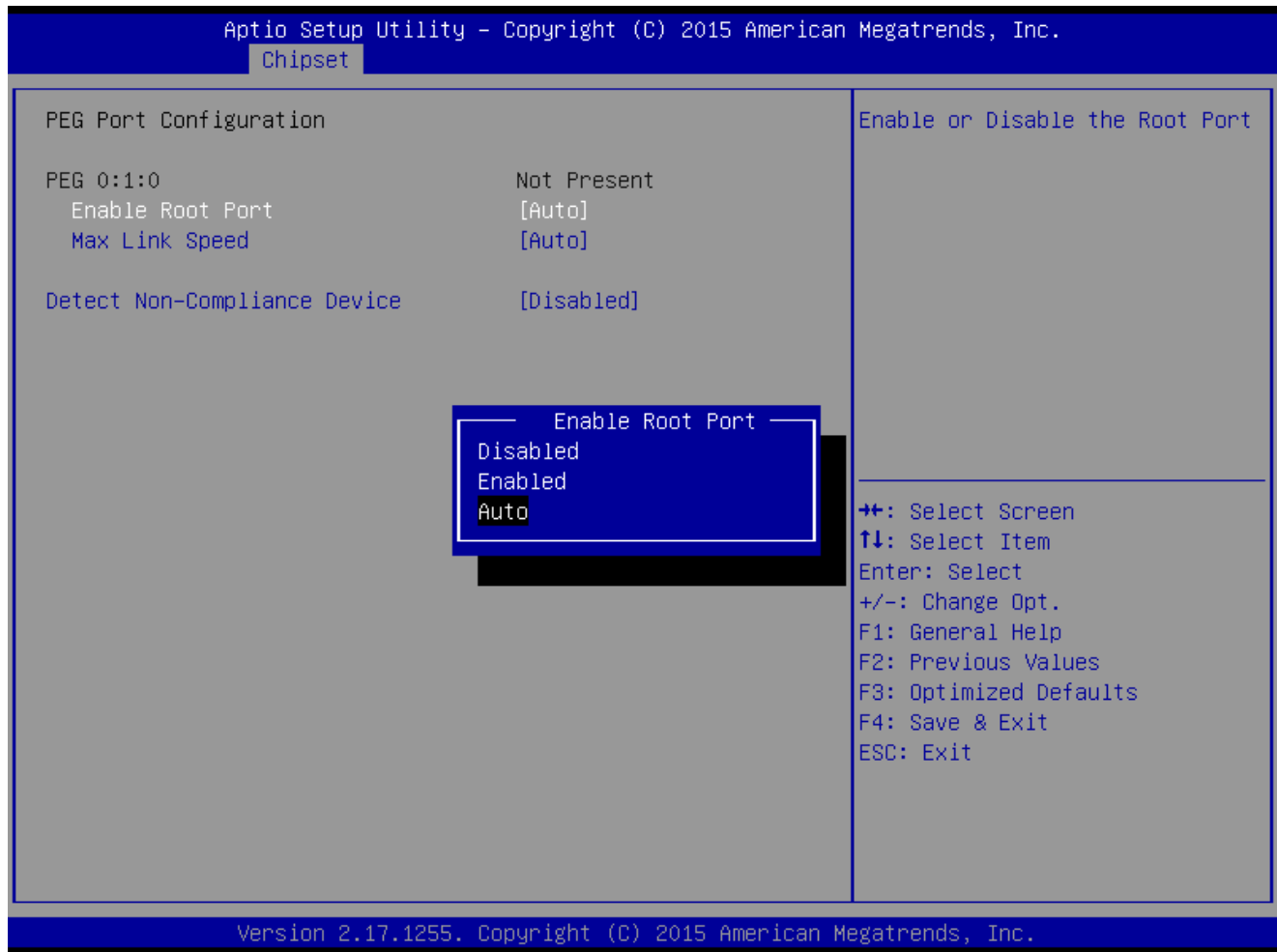
Select DVMT 5.0 Pre-allocated (Fixed) Graphics memory size used by the internal graphics device. Configuration options: As below picture



- **DVMT total Gfx Mem [256M]**

Select DVMT 5.0 Total graphic memory size used by the internal graphic device
Configuration options: [128M][256M][Max]

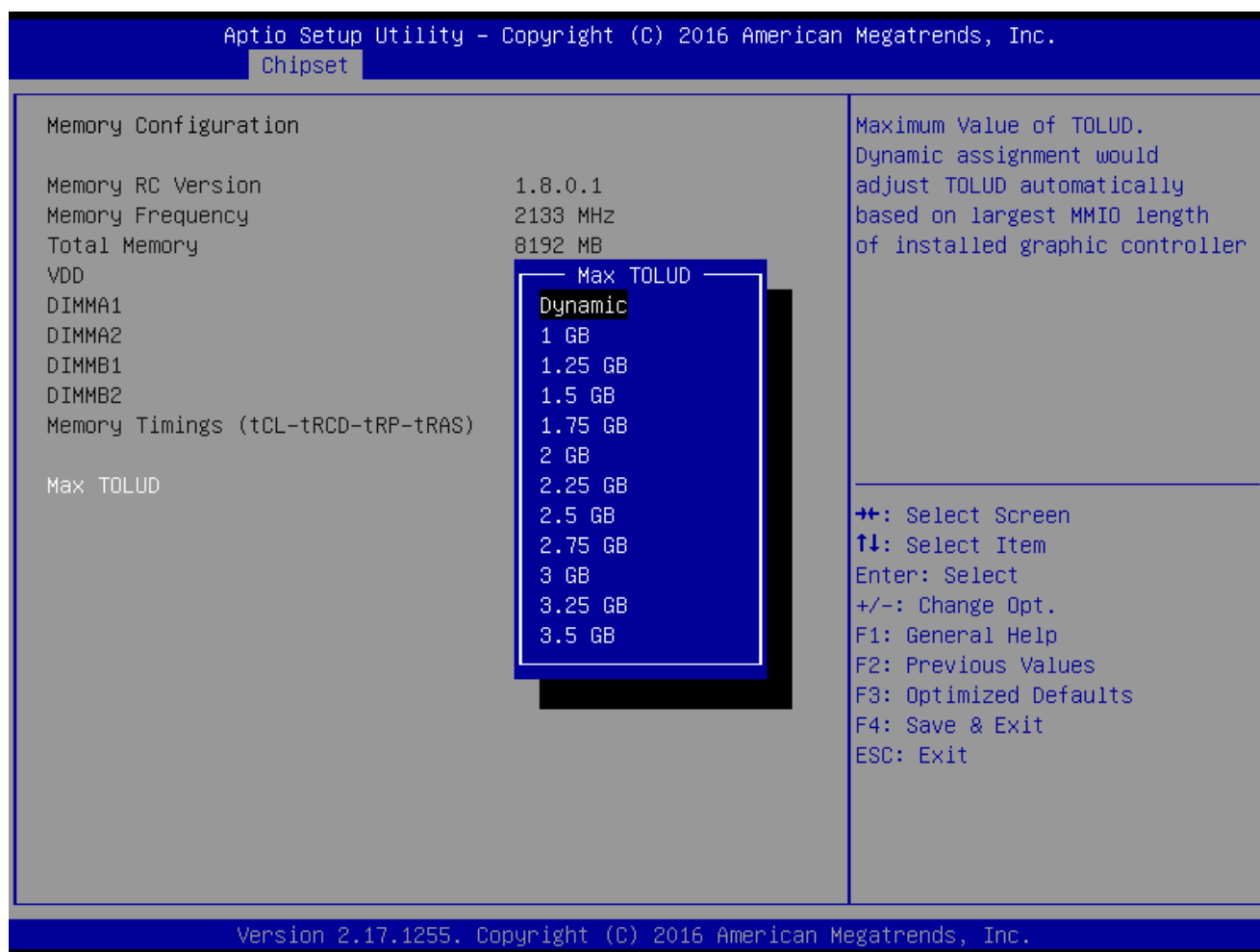
2. PEG Port Configuration



- **Enable root Port [Auto]**
Enable or Disable the root port
Configuration options: [Disabled][Enabled][Auto]
- **Max Link Speed [Auto]**
Configure PEG 0:1:0 Max Speed
Configuration options: [Auto][Gen1][Gen2][Gen3]
- **Detect Non-Compliance Device [Disabled]**
Detect non-compliance PCI express Device in PEG
Configuration options: [Disabled][Enabled]

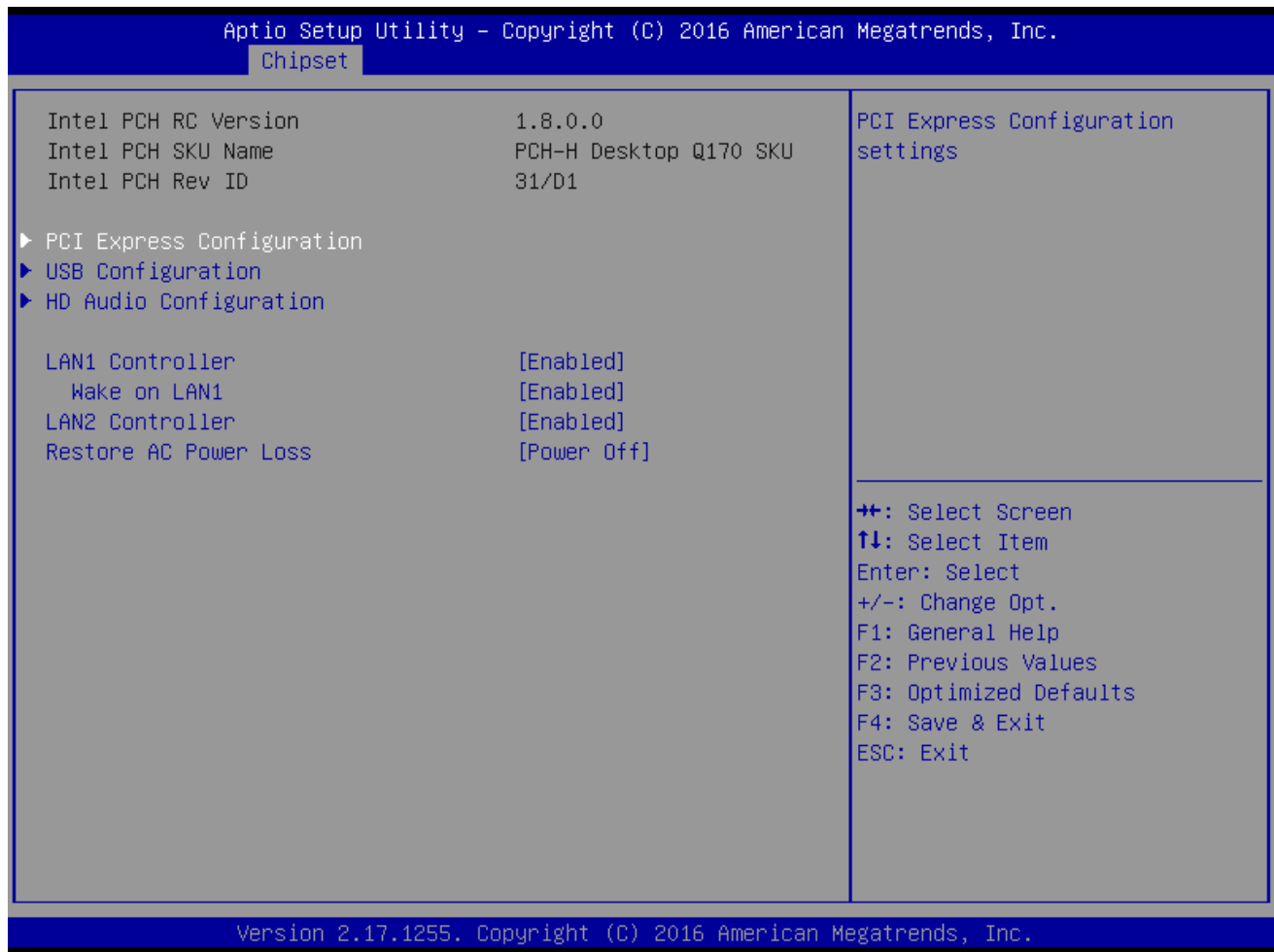
3. Memory configuration

Display memory information



- **Max TOLUD [Dynamic]**
Maximum value of TOLUD.
Configuration options: As above picture

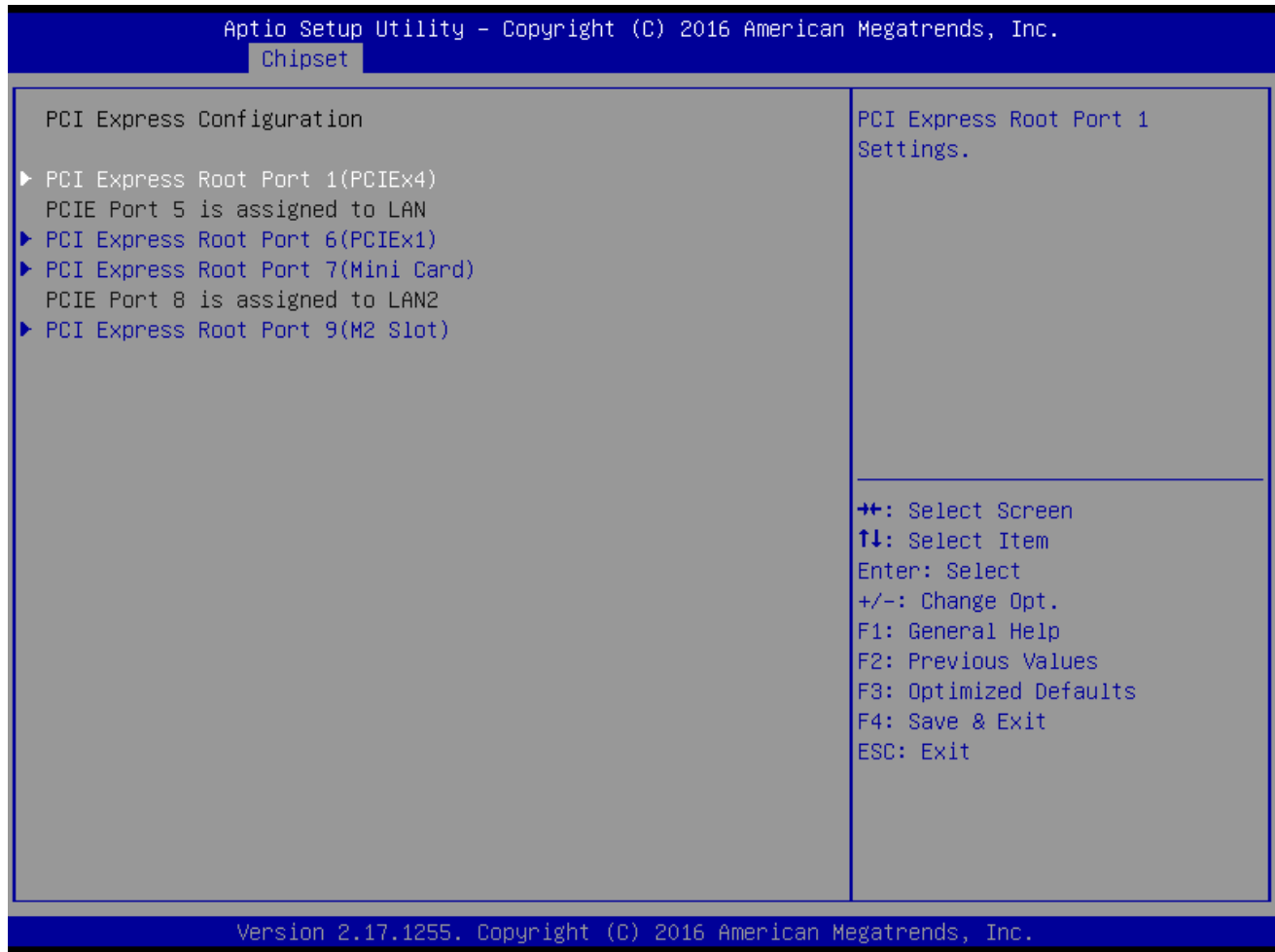
2.5.2 PCH-IO configuration



- **Lan1 Controller [Enabled]**
Enable or Disable onboard Lan1
Configuration options: [Disabled][Enabled]
- **Wake on lan [Auto]**
Enable or Disable integrated LAN to wake the system
Configuration options: [Disabled][Enabled]
- **Lan2 Controller [Enabled]**
Enable or Disable onboard Lan2
Configuration options: [Disabled][Enabled]
- **Restore AC power Loss [Power off]**
Specify what state to go to when power is re-applied after a power failure.
Configuration options: [Power on][Power off][Last State]

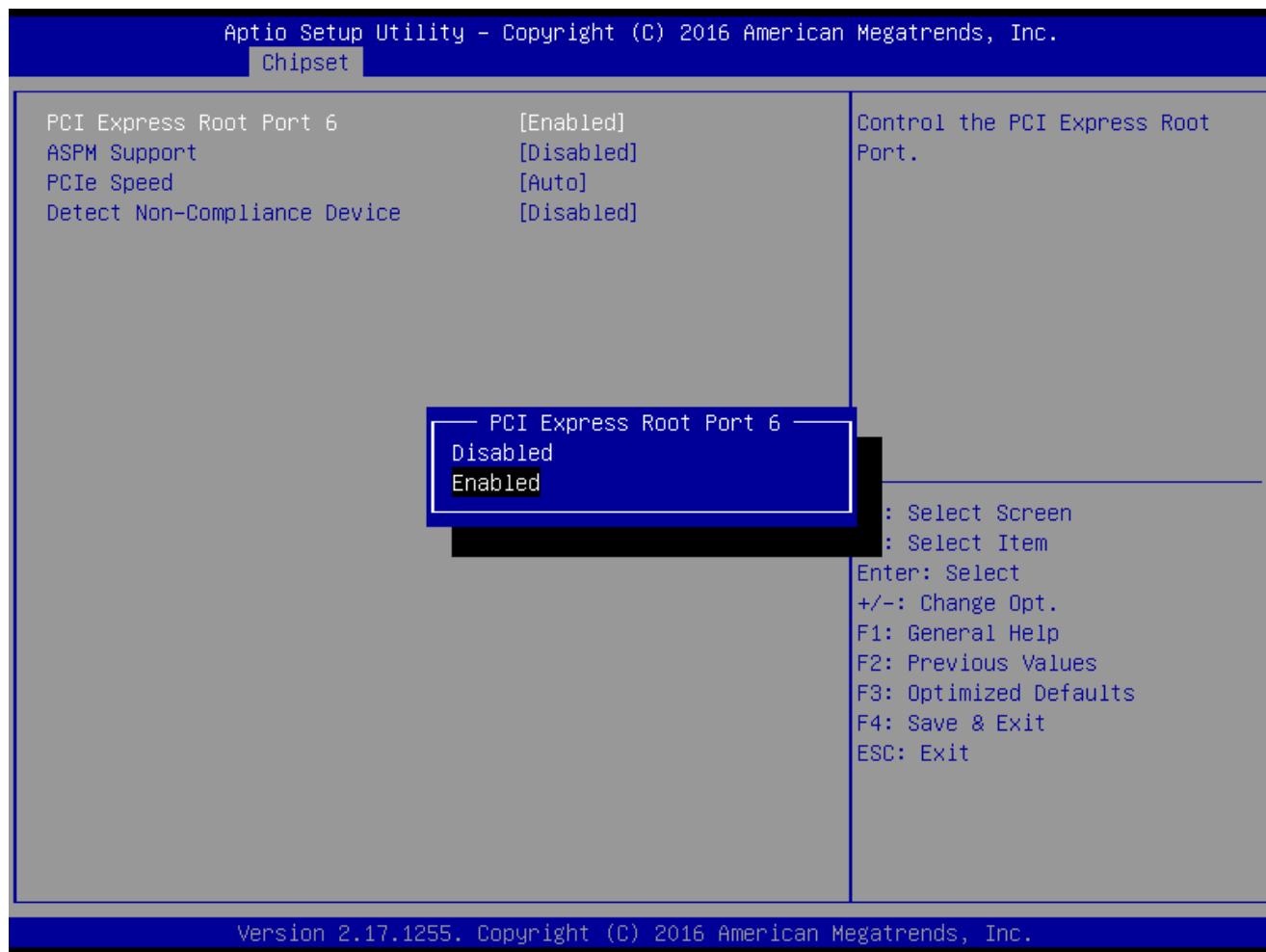
1. PCI Express configuration

1.1 PCI Express Root Port 1



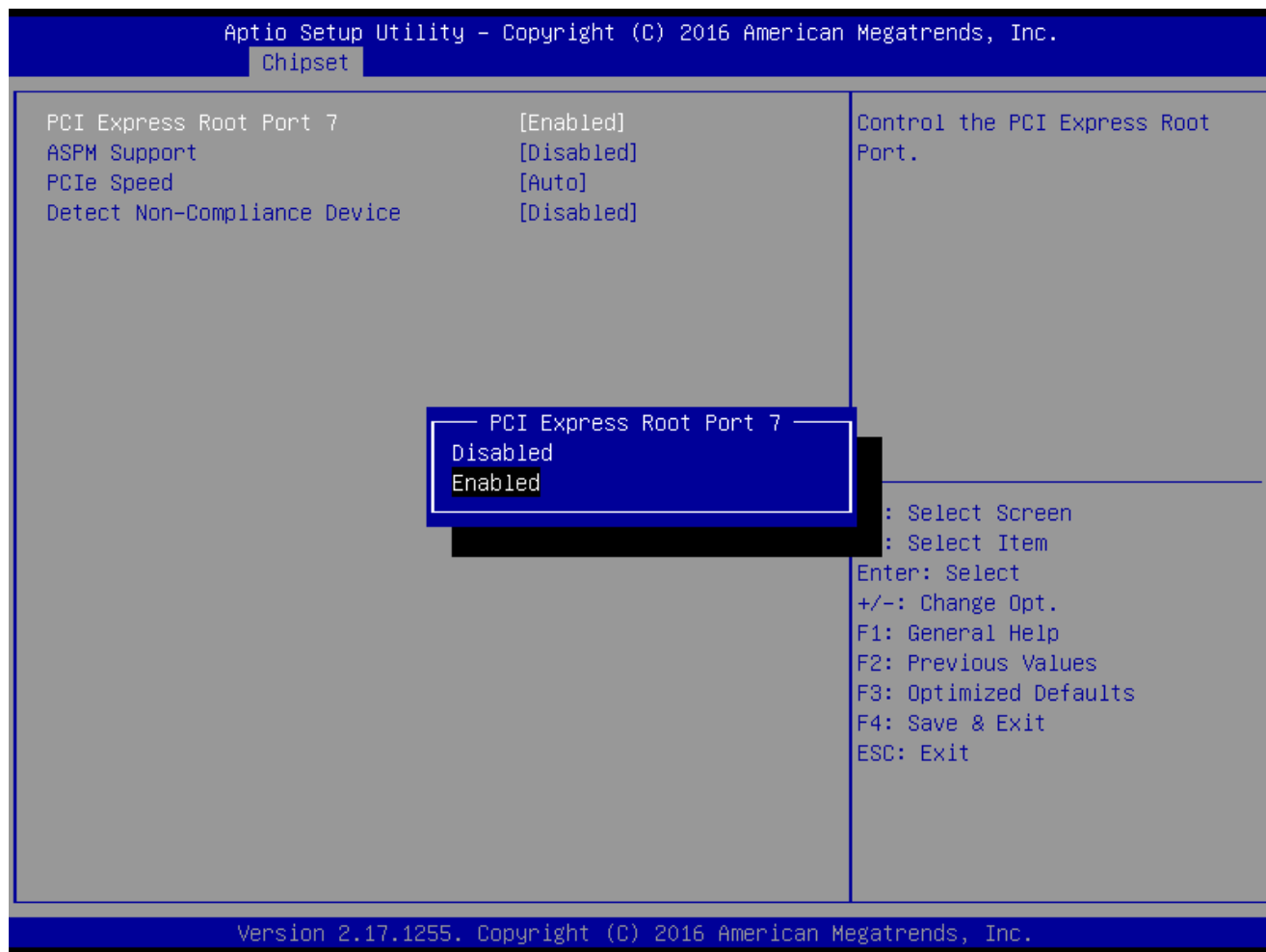
- **PCI Express Root Port 1 [Enabled]**
Control the PCI Express Port
Configuration options: [Disabled][Enabled]
- **ASPM Support [Disabled]**
Set the ASPM level: Force L0s- Force all links to L0s State; Auto- BIOS auto configure; Disabled- Disables ASPM
Configuration options: [Disabled][L0s][L1][L0sL2][Auto]
- **PCIe Speed [Auto]**
Select PCI Express Port speed
Configuration options: [Auto][Gen1][Gen2][Gen3]
- **Detect Non-compliance device [Disabled]**
Detect non-compliance PCI express Device, If enabled, it will take more time at Post time.
Configuration options: [Disabled][Enabled]

1.2 PCI Express Root Port 6



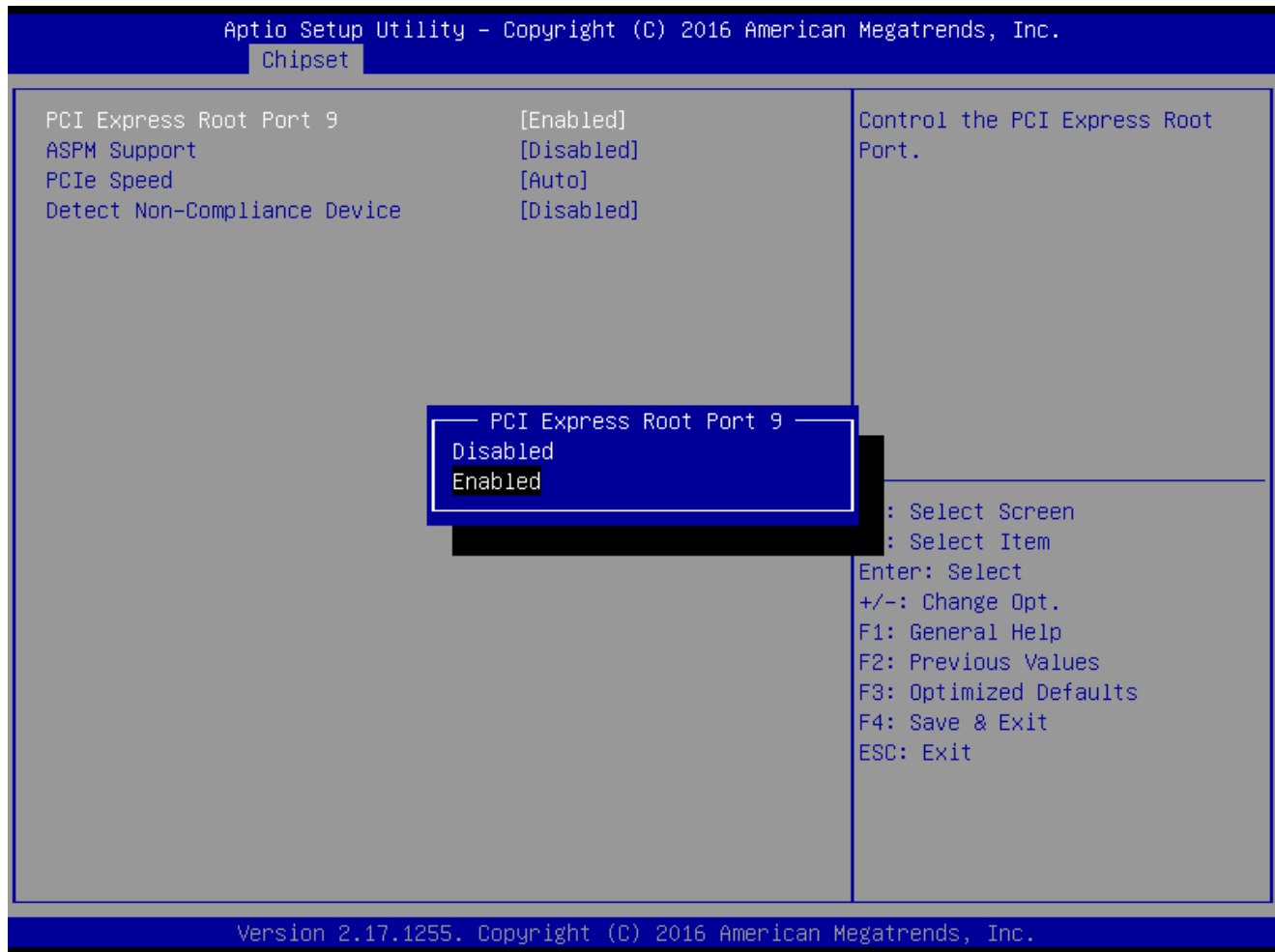
- **PCI Express Root Port 6 [Enabled]**
Control the PCI Express Port
Configuration options: [Disabled][Enabled]
- **ASPM Support [Disabled]**
Set the ASPM level: Force L0s- Force all links to L0s State; Auto- BIOS auto configure; Disabled- Disables ASPM
Configuration options: [Disabled][L0s][L1][L0sL2][Auto]
- **PCIe Speed [Auto]**
Select PCI Express Port speed
Configuration options: [Auto][Gen1][Gen2][Gen3]
- **Detect Non-compliance device [Disabled]**
Detect non-compliance PCI express Device, If enabled, it will take more time at Post time.
Configuration options: [Disabled][Enabled]

1.3 PCI Express Root Port 7



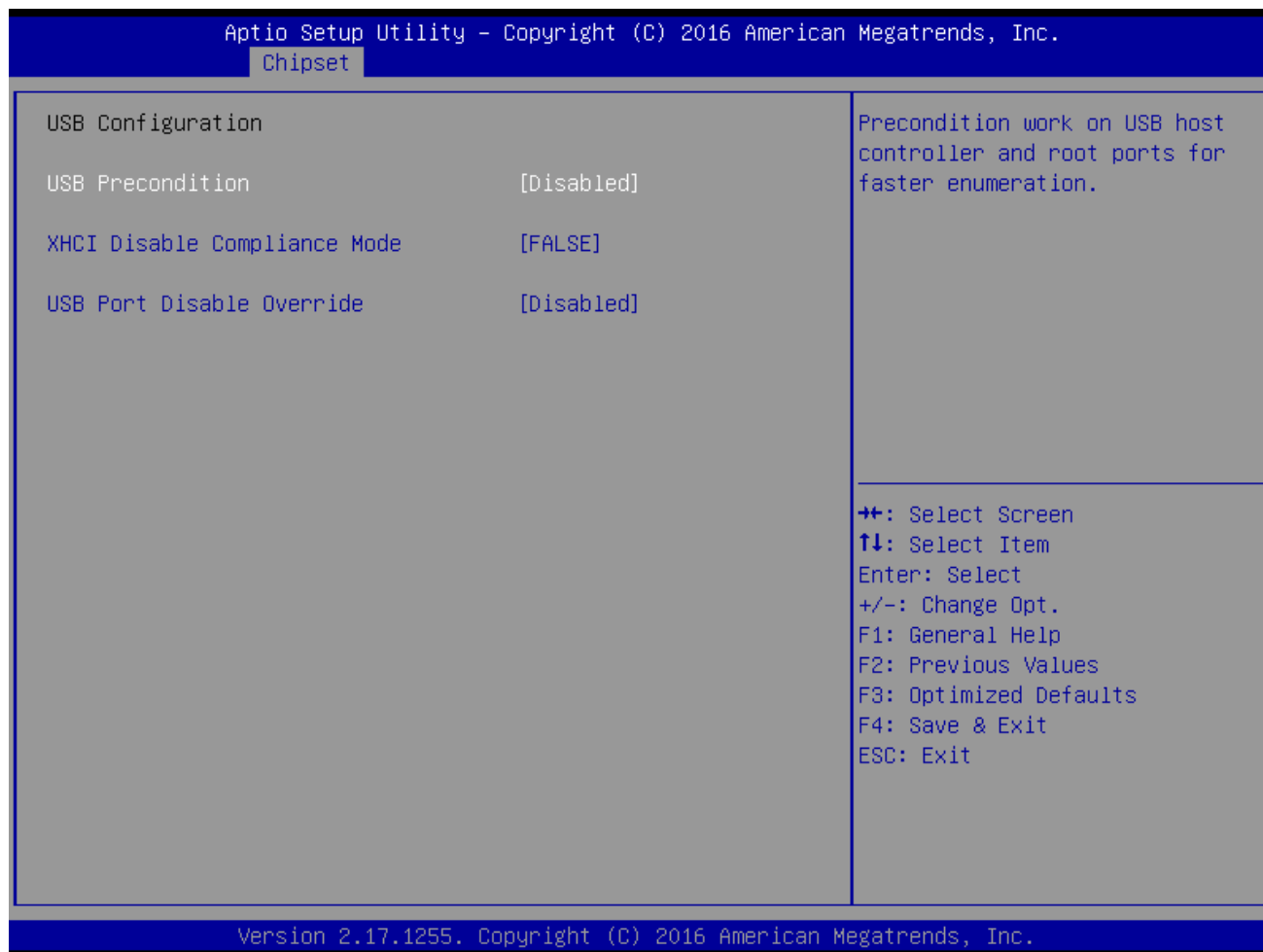
- **PCI Express Root Port 7 [Enabled]**
Control the PCI Express Port
Configuration options: [Disabled][Enabled]
- **ASPM Support [Disabled]**
Set the ASPM level: Force L0s- Force all links to L0s State; Auto- BIOS auto configure; Disabled- Disables ASPM
Configuration options: [Disabled][L0s][L1][L0sL2][Auto]
- **PCIe Speed [Auto]**
Select PCI Express Port speed
Configuration options: [Auto][Gen1][Gen2][Gen3]
- **Detect Non-compliance device [Disabled]**
Detect non-compliance PCI express Device, If enabled, it will take more time at Post time.
Configuration options: [Disabled][Enabled]

1.4 PCI Express Root Port 9



- **PCI Express Root Port 9 [Enabled]**
Control the PCI Express Port
Configuration options: [Disabled][Enabled]
- **ASPM Support [Disabled]**
Set the ASPM level: Force L0s- Force all links to L0s State; Auto- BIOS auto configure; Disabled- Disables ASPM
Configuration options: [Disabled][L0s][L1][L0sL2][Auto]
- **PCIe Speed [Auto]**
Select PCI Express Port speed
Configuration options: [Auto][Gen1][Gen2][Gen3]
- **Detect Non-compliance device [Disabled]**
Detect non-compliance PCI express Device, If enabled, it will take more time at Post time.
Configuration options: [Disabled][Enabled]

2. USB Configuration



- **USB Precondition[Disabled]**

Precondition work on USB host controller and root ports for faster enumeration

Configuration options: [Disabled] [Enabled]

- **XHCI Disabled Compliance Mode [False]**

Options to disable compliance mode.

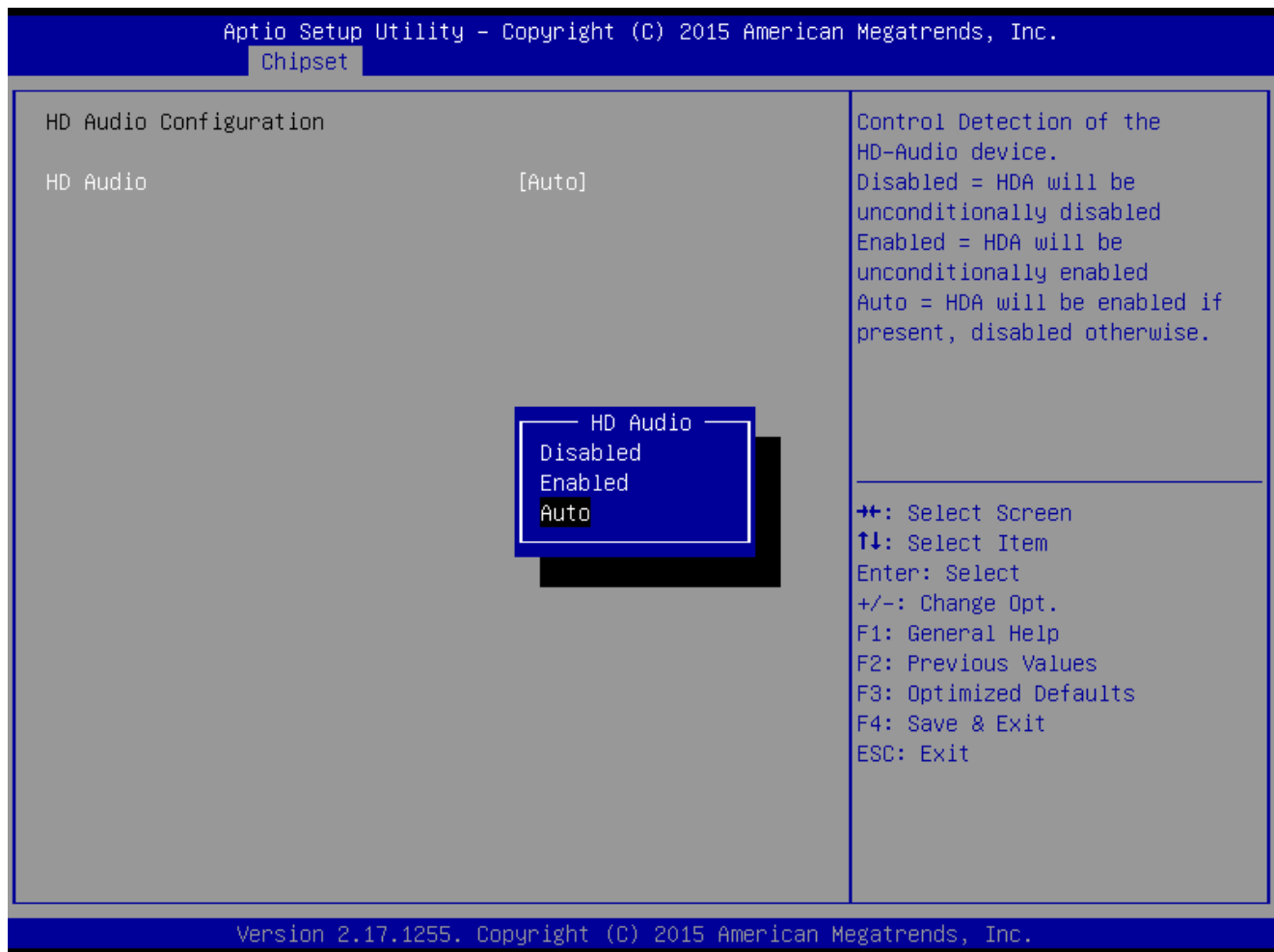
Configuration options: [False][true]

- **USB Port Disable override [Disabled]**

Selectively Enabled/Disabled the corresponding USB port from reporting a device connection to the controller.

Configuration options: [Disabled] [Select Per-Pin]

3. HD Audio Configuration

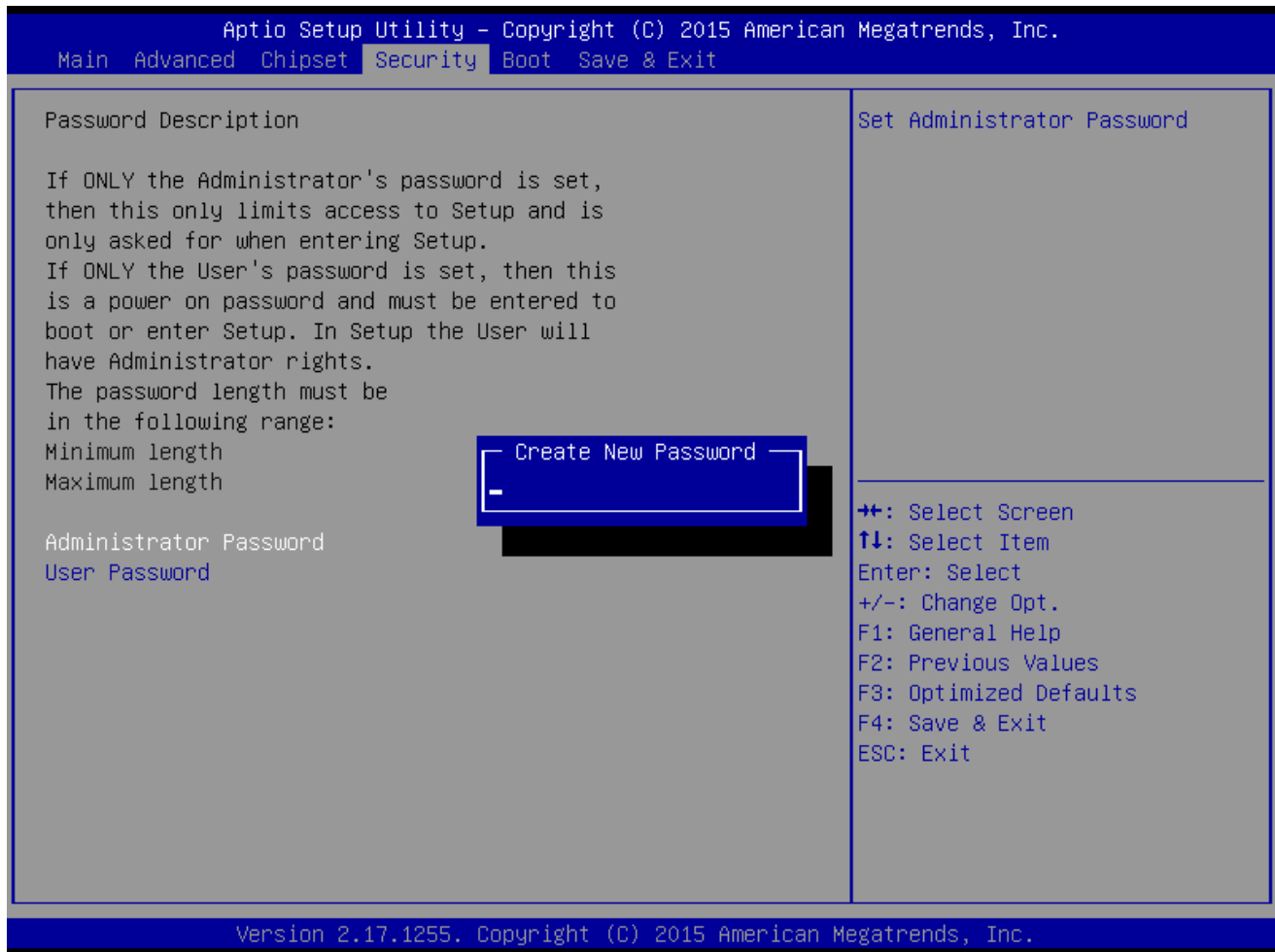


- **HD audio[Auto]**

Control Detection of the HD-Audio device.

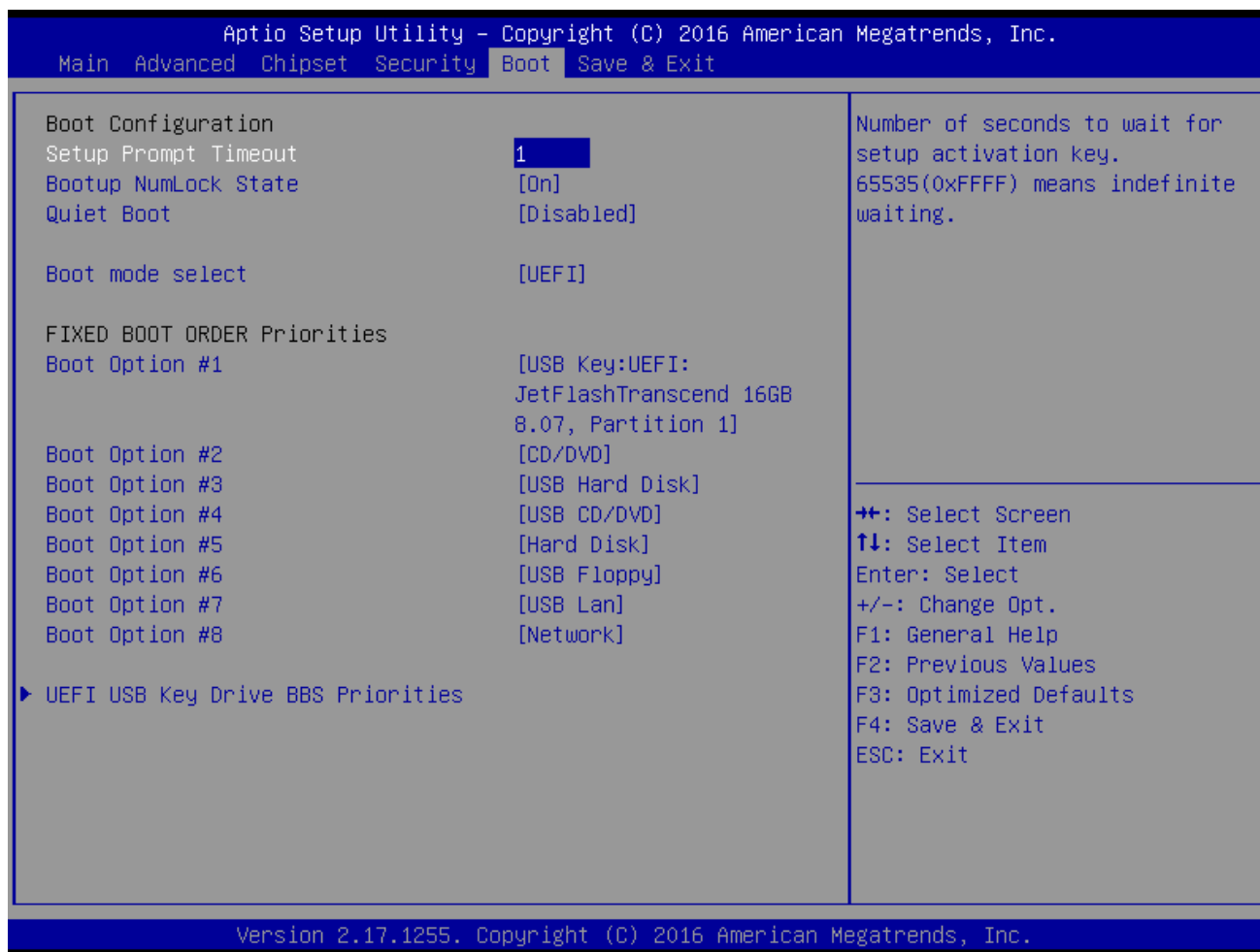
Configuration options: [Disabled] [Enabled][Auto]

2.6 Security



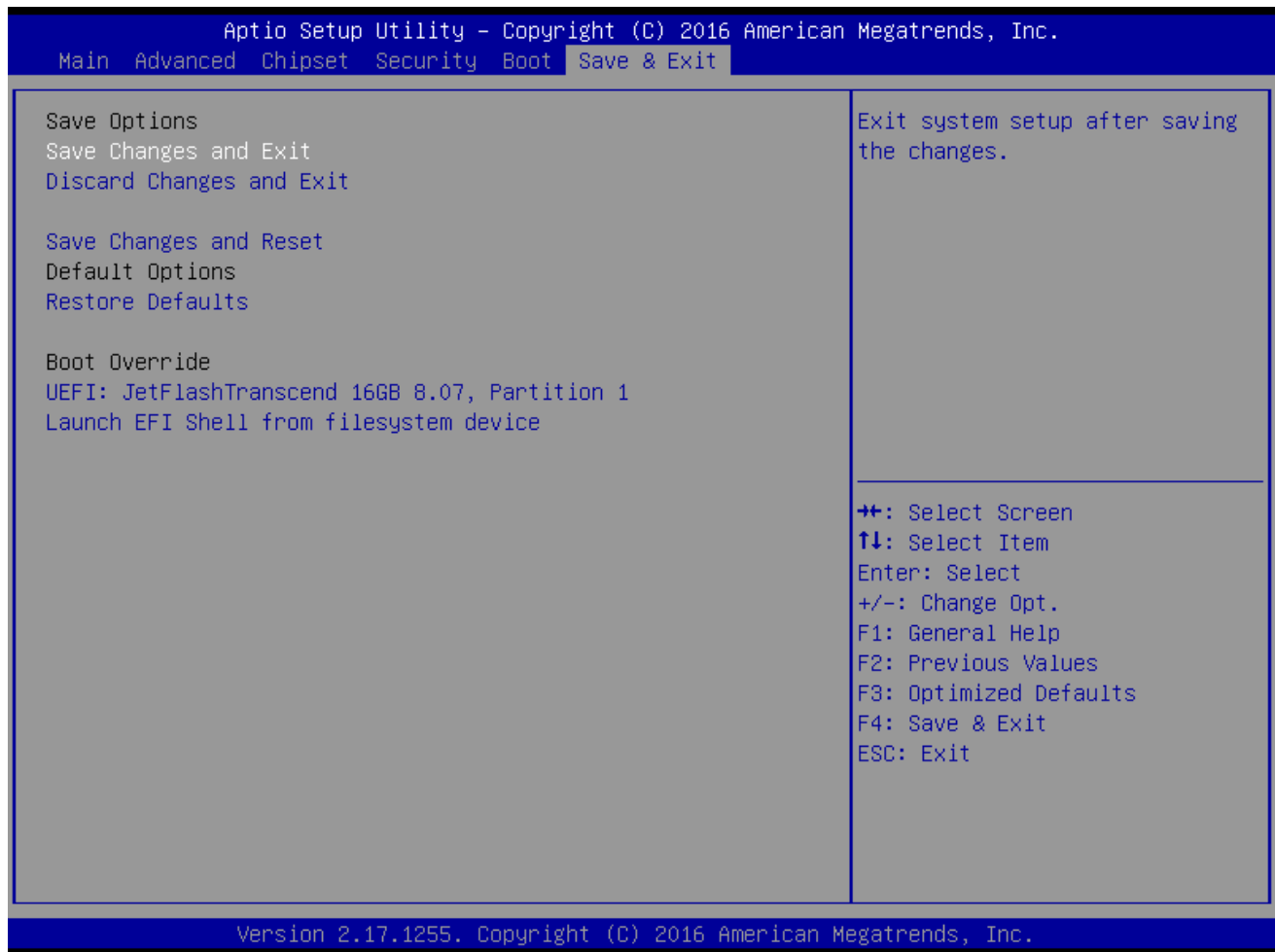
- **Administrator Password**
Set setup Administrator Password
- **User Password**
Set User Password

2.7 Boot



- **Setup Prompt Timeout [1]**
Number of seconds to wait for setup activation key. 65535(0xFFFF) means indefinite waiting.
- **Bootup NumLock State [On]**
Select the keyboard NumLock state
Configuration options: [On] [Off]
- **Quick Boot [Disable]**
Enable or disable Quick Boot option
Configuration options: [Disabled] [Enabled]
- **Boot mode select [UEFI]**
Select boot mode LEGACY/UEFI
Configuration options: [LEGACY] [UEFI]
- **UEFI USB Key Drive BBS Priorities**
Specifies the boot device priority sequence from available UEFI USB key Drives.
- **UEFI Network Key Drive BBS Priorities**
Specifies the boot device priority sequence from available UEFI Network key Drives.

2.7 Save & Exit



- **Save changes and Exit**
Exit system setup after saving the changes.
- **Discard changes and Exit**
Exit system setup without saving the changes.
- **Save changes and Reset**
Reset the system after saving the changes.
- **Restore Defaults**
Restore/Load default values for all the setup option.
- **Launch EFI Shell from filesystem device**
Attempts to launch EFI shell application from one of the available filesystem devices.

Appendix

WDT & GPIO

This appendix provides the sample codes of WDT (Watch Dog Timer) and GPIO (General Purpose Input/ Output).

GPI and GPO pins may be implemented as GPIO.

Signal	I/O	Description
GPO[0:3]	O	General purpose output pins. Upon a hardware reset, these outputs should be low.
GPI[0:3]	I	General purpose input pins. Pulled high internally on the Module.

GPIO Configuration

Board Design

Pin#	GPIO#	Default Configuration
1		+5V_DUAL
2		GND
3	GP34	GPO0
4	GP30	GPI0
5	GP35	GPO1
6	GP31	GPI1
7	GP36	GPO2
8	GP32	GPI2
9	GP37	GPO3
10	GP33	GPI3

Notes

1. Output pin default setting is “**HIGH**”

The GPIO function is provided by a Nuvoton NCT6106D, and it can be accessed through its GPIO index/data port. The index port is the base address

+0 and the data port is the base address +1. To access the GPIO register, write index to the index port, and then read/write from/to data port. The configuration is described as below.

Super I/O entry key: 0x87

Index Port	0x2E
Data Port	0x2F

Registers Description

GPIO Input / Output Select:

Location: Address ECh
 Attribute: Read/Write
 Reset by: GP3X_MRST
 Default: FFh
 Size: 8 bits

BIT	READ/WRIT	Description
7-0	R/W	GPIO3 I/O register 0: The respective GPIO3 PIN is programmed as an output port 1: The respective GPIO3 PIN is programmed as an input port.

GPIO Output Data Select:

Location: Address EDh
 Attribute: Read/Write
 Reset by: GP3X_MRST
 Default: 00h
 Size: 8 bits

BIT	READ/WRIT	Description
7-0	R/W	GPIO3 Data register For output ports, the respective bits can be read/written and produced to pins.
	Read Only	For input ports, the respective bits can be read only from pins. Write accesses will be ignored.

Note.

Bit X = 0 outputs low when in output mode
 Bit X = 1 outputs high when in output mode

Index Port	0x2E
Data Port	0x2F

Watchdog Timer

Board Design

The Watchdog Timer (WDT) is implemented by Nuvoton NCT6106D.

Pseudo Code

```
#include<dos.h>
#include<stdio.h>
void main(void){
    // for 2E
    int x,pre_rd,rd,status;
    clrscr();
    outportb(0x2E,0x87);
    outportb(0x2E,0x87);
    outportb(0x2E,0x30); //CR30 bit1=1 pin77 select WDTO#
    outportb(0x2F,0x01);
    outportb(0x2E,0x07);
    outportb(0x2F,0x08); //Logic Device8 (LD8)
    outportb(0x2E,0x30);
    outportb(0x2F,0x01); //Enable WDTO#

    // Reset WDTO# and clear WDTO# timeout event
    outportb(0x2E,0xF6);
    outportb(0x2F,0x00); //Reset WDTO# Timer
    outportb(0x2E,0xF7); //Logic Device 8, CRF7
    outportb(0x2F,0x00); //Write Bit4=0 to clear WDTO# event!

    // Input Timer value
    printf("Enter WDTO# Timer(second):");
    scanf("%d",&x);
    pre_rd = x + 1;
    // Set Timer and Start count
    outportb(0x2E,0xF6); //LD8,CRF6h Set WDTO# Timer
    outportb(0x2F,x);

    // Check the timeout event
    // LDN8 CRF7[4] = 1 (Timeout occur)
    do{
        // Read Count
        outportb(0x2E,0xF6); //LD8,CRF6h Set WDTO# Timer
        rd = inportb(0x2F);
        // Read Timeout event
        outportb(0x2E,0xF7); //Logic Device 8, CRF7
        status = inportb(0x2F);
        // check pre-status
        if (rd < pre_rd){
            printf("Timer = %d\n",rd);
            pre_rd = rd;
        }
    }while(status != 0x10);
    printf("Timer Timeout.\n");

    printf("Input any key to reset timeout event\n");
    getch();

    // Reset WDTO# and clear WDTO# timeout event
    outportb(0x2E,0xF6);
    outportb(0x2F,0x00); //Reset WDTO# Timer
    outportb(0x2E,0xF7); //Logic Device 8, CRF7
    outportb(0x2F,0x00); //Write Bit4=0 to clear WDTO# event!
```

